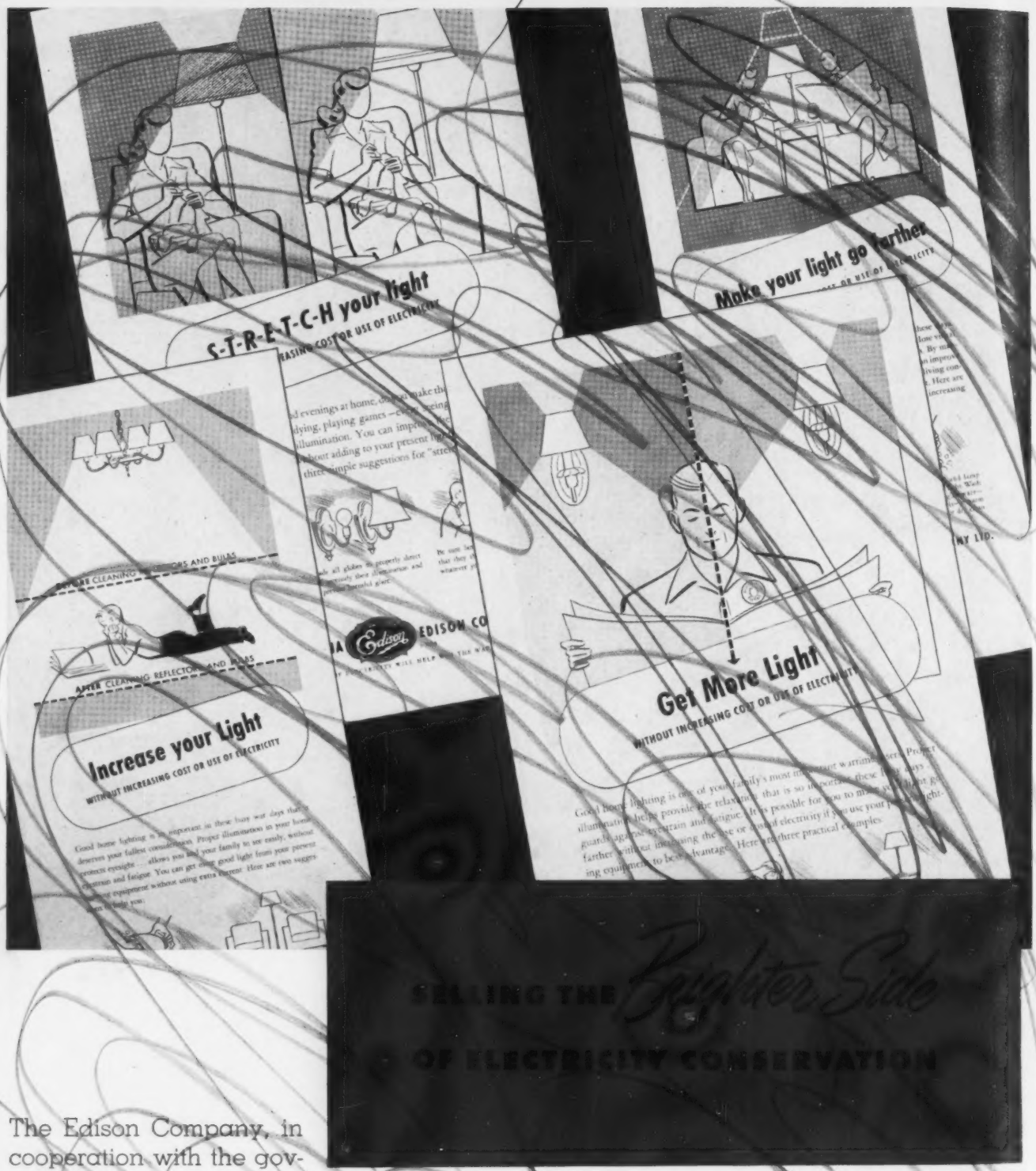
# ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

McGraw-Hill Co.
San Francisco, California

DECEMBER, 1943

25c a Copy


S-T-R-E-T-C-H your light
Make your light go farther
Increase your Light
WITHOUT INCREASING COST OR USE OF ELECTRICITY
Get More Light
WITHOUT INCREASING COST OR USE OF ELECTRICITY
Edison
SELLING THE Brighter Side
OF ELECTRICITY CONSERVATION

The Edison Company, in cooperation with the government, urges its customers to conserve electricity. But at the same time, Edison advertising has continued to tell the story of better home lighting. Reproduced above is a series of Edison advertisements which recently has appeared in newspapers throughout Edison-served territory. These advertisements stress the necessity for having the home well-lighted for work and play, and they show consumers how to obtain better illumination from their present lighting equipment without increasing cost or use of electricity. Thus, a two-fold wartime service is perfomed.

CONSERVATION OF ELECTRICITY WILL HELP WIN THE WAR

**SOUTHERN CALIFORNIA EDISON COMPANY LTD.**

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*A West Coast Operating Engineer agrees:*

**"If we expect to keep our costs down after the war, we must take full advantage of standardized lines of equipment offered by manufacturers at lower prices."**

THIS is one of the many encouraging reactions to General Electric's recent proposal to extend the use of standard designs to the heavy-apparatus field. It helps bear out our belief that the most direct way to lower tomorrow's capital investment will be found in the economies of repetitive manufacture — of power transformers, switchgear, and other heavy apparatus.

As an example, General Electric found it possible to lower prices 35 per cent on factory-assembled switchgear, as it replaced more and more "one-of-a-kind" switchgear units. And in our war production of other heavy apparatus, equally important cost economies have come out of repetitive manufacture.

Of course, the possibilities for future savings cannot be realized by the individual effort of any manufacturer — or even by the manufacturing industry as a whole. Rather, builders and users must work together, each accepting minor limitations on individual preference for the sake of major gains over-all.

We believe that both branches of the electrical industry are ready to take this step. If you confirm this opinion, won't you, too, tell us? *General Electric Company, Schenectady, N. Y.*

**GENERAL ELECTRIC**

201-103-170

# Here in the WEST

## People

**V. B. Wilfley**

was engineer in the Seattle office of Westinghouse when he gave the paper, reproduced in two parts, the first in this issue, p. 54, to the inspectors meeting. Since then he has been transferred to St. Louis, Mo. Native of Iowa, he was graduated from New Mexico State in 1923, joined Westinghouse at East Pittsburgh. In 1920 he was sent to Seattle. He is a member of the staff of the engineering and service department. Wilfley has been the author of several technical articles and papers. This on a-c welding is particularly appropriate because of the extensive use of it in Western war industries.

**E. W. Morris**

whose series on electronics begins on p. 47, is no stranger to our readers, having written for us before. His qualifications for a series on electronics include the teaching of nine classes since 1934 to his own Westinghouse office, Los Angeles, and to utilities and ESMWT classes in California colleges. He is vice-chairman of the newly formed electronics division, Los Angeles Section, AIEE. Besides that he "thinks that electronics has a very promising future in industry, but that it should be applied sensibly." So does ELECTRICAL WEST—therefore this series.

**J. A. Hill**

whose novel idea to get rid of what Earl Whitehorne called "the sacred cow of contracting," old No. 14 wire for housewiring, is printed in full, p. 61, is domestic utilization engineer for Pacific Gas and Electric Co., San Francisco.

## Pages


**"They Didn't Believe We Could Do It"** ..... 45
By George C. Tenney—An interview with Wing Commander Guy P. Gibson, leader of the British bombers flight which blasted three German dams.

**Electronics at Work in Industry—I** ..... 47
By E. W. Morris—First of a series of articles dealing with the fundamentals of electronic tubes and circuits and giving commercial applications.

**A-C Welders—Construction, Operation—I** .... 54
By V. B. Wilfley—Characteristics, operation and theory of a-c welding

**PCEA Takes Stock at War Conferences** ..... 67
Wartime and postwar operations studied at Los Angeles and San Francisco meetings

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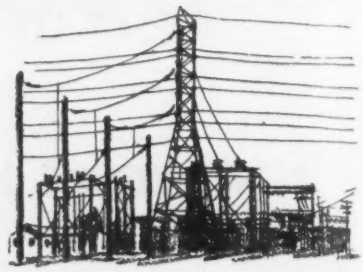
Cover—Memories of the cheer of outdoor Christmas lighting (discouraged by WPB this year although freed of dimout restrictions), remind us that this is a freedom for which we sacrifice and fight This nostalgic picture was of a grand prize winner in Spokane in 1941, the home of B. J. Saad.

## Preview

**Butadiene**



from which Buna synthetic rubber is made, is now being turned out in quantity, even if at considerable odor, from a Los Angeles gas plant. Power for this plant had to make use of substitutes also in order to get down from the transmission line to the transformers without requiring any critical steel. How this interesting substation was constructed out of wood and how the particular engineering problems incident to such a conversion of practice were solved, will be discussed in the next issue. Also, to accompany this article, will appear the second electronics article by E. W. Morris, and the last half of Vernon Wilfley's paper on a-c welding. The latter will treat of the safety aspects and the National Electrical Code rules in respect to a-c weldings. As this kind of welding increases in all types of industry, these aspects are highly important.

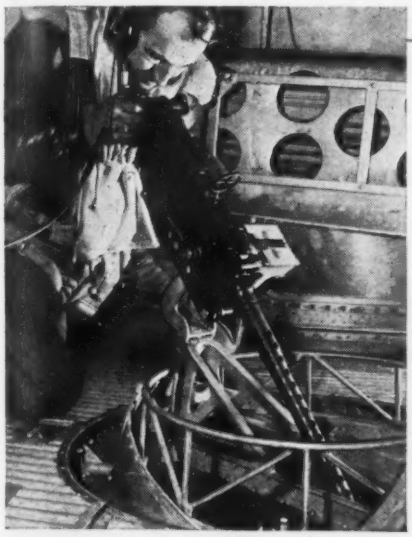
**Fore and Aft**

Janus, the god who looked both ways at once, is appropriate to January this new year ahead, for as we look back over our two years of war and appreciate the strides made, the outlook ahead looks much brighter, so bright in fact that it is time to do real thinking about the future. Realizing that ELECTRICAL WEST, from a more objective standpoint, may be able to clarify and unscramble some of the confusing and involved questions, it will initiate a series of surveys on that score early next year.

# A quick picture of

# FRIGIDAIRE'S WARTIME PROGRAM

## and what it means to Frigidaire Dealers



*Official O. W. I. photo*

### ARMS FOR VICTORY

**Victory Is Our Business.** Building weapons of war has been and continues to be our first and most important responsibility.

We take pride in the recognition we have received for the job being done in Frigidaire's four war production plants.

In the Army-Navy "E" Flag and star awarded to us for excellence, and the Army Air Force "A" rating we have received.

Today more men and women are employed in Frigidaire plants than ever before in our history. And our war production is still mounting.

Only when the whole story of Frigidaire's planning and production can be told will the full significance of the statement "Victory is our business" be apparent.

**What This Means to Frigidaire Dealers**

*Wartime accomplishments have brought us new knowledge and skills that will benefit the Frigidaire dealer when we return to peacetime production, and surely Frigidaire's wartime record will enhance the value of the Frigidaire name.*

### KEEPING 'EM RUNNING

**Victory Is Our Business** on the home front, too. And keeping the millions of Frigidaire products operating efficiently is another important responsibility. For today the nation's food supply must be protected and conserved as never before.

We're proud of the dependable way in which Frigidaire household appliances and commercial equipment are serving their users.

Proud, too, of the Frigidaire dealers and service men who are guarding this record of dependability during these trying times.

We are constantly helping this service organization in every way we can. By supplying vital parts; by providing training aids; and by holding frequent factory and district-conducted schools to help dealers train service men.

**What This Means to Frigidaire Dealers**

*Frigidaire service today is building a backlog of customer satisfaction and good will that will mean increased sales for Frigidaire Dealers after the war. Right now, this service business is helping Frigidaire dealers maintain income during a critical period.*

### HELPING THE USER

**Victory Is Our Business.** The proper use and care of the nation's 20 million household refrigerators is vitally important to the war effort on the home front.

Frigidaire accepted the responsibility of providing needed wartime information . . . not only to Frigidaire users, *but to every owner of a refrigerator.*

Month after month Frigidaire's advertising messages in leading magazines have told housewives how to make their refrigerators serve better and last longer.

Similar help has been given in Frigidaire's 36-page WARTIME SUGGESTIONS booklet. More than six and a half million copies have been distributed . . . *most of them by Frigidaire Dealers.*

Home economists, group leaders and other organizations were given helpful information for their use. Hundreds of users, home economists, dealers and others have sent us unsolicited letters endorsing the program's aims and purpose.

**What This Means to Frigidaire Dealers**

*This comprehensive program is keeping the name Frigidaire before the public in a way that will be favorably remembered. And it is also helping Frigidaire dealers maintain identification with Frigidaire and build good will for themselves in their communities.*

### PLANNING FOR THE FUTURE

**Victory Is Our Business** so we have little time for future planning. But, every moment we can spare without interfering in any way with war work is devoted to this important subject.

*Every* Frigidaire dealer, large or small, has been given an opportunity to express his views and desires on every phase of our post war business. These views and opinions are being carefully considered and will play an important part in the planning of our peacetime selling activities.

**What This Means to Frigidaire Dealers**

*After Victory there will be more and better Frigidaire products for more people. Frigidaire dealers will have the right merchandise, the right selling tools and every support they need to keep on top. Frigidaire's 25-year record of leadership is a blueprint of the future.*

*For Excellence*

ARMY E NAVY

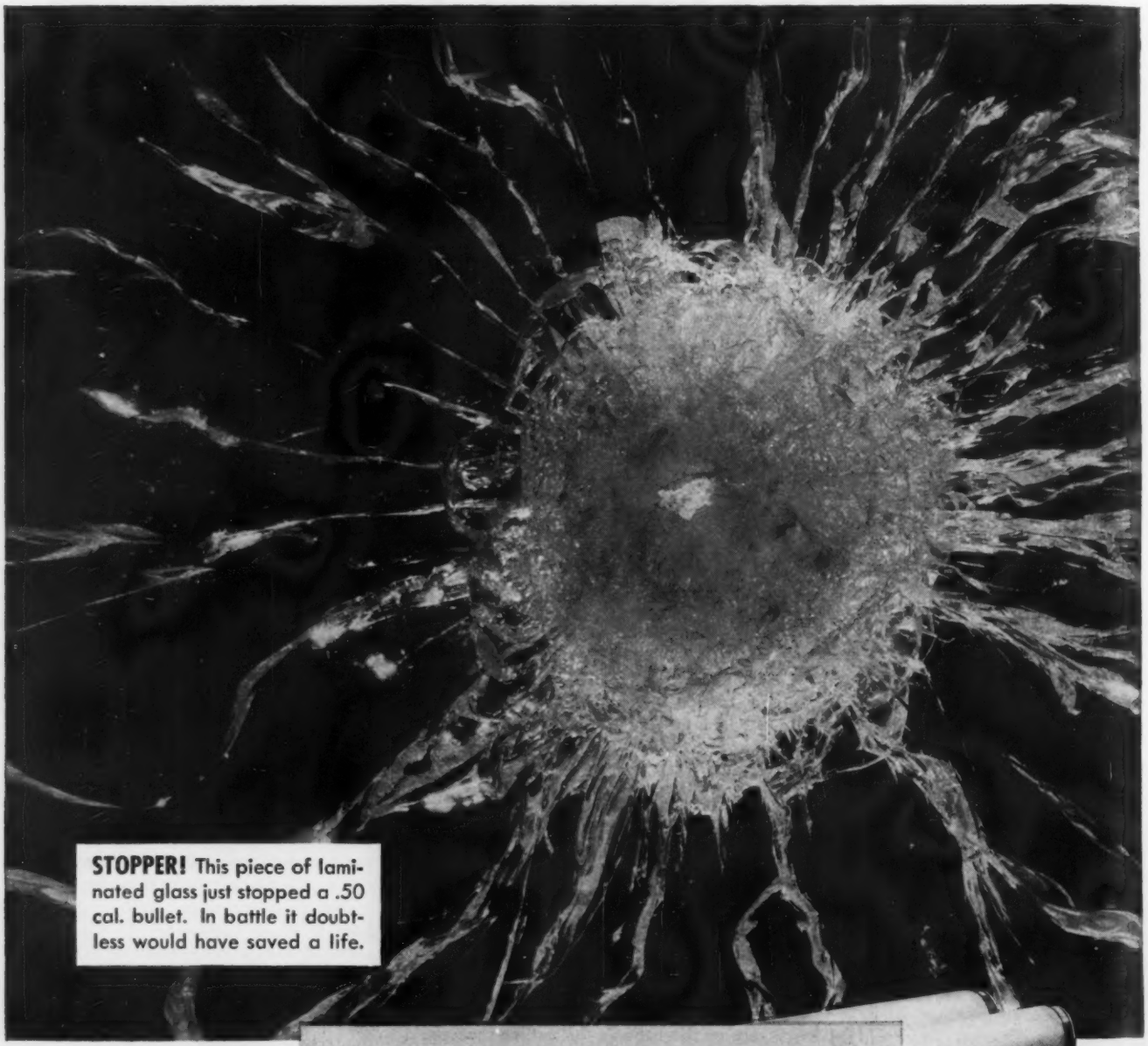
*in War Production*

*Listen to GENERAL MOTORS SYMPHONY OF THE AIR; Every Sunday Afternoon, NBC Network*

**FRIGIDAIRE Division of GENERAL MOTORS**

**Peacetime Builders of HOME APPLIANCES · COMMERCIAL REFRIGERATION · AIR CONDITIONERS**

# Greater security for men



**STOPPER!** This piece of laminated glass just stopped a .50 cal. bullet. In battle it doubtless would have saved a life.

## Westinghouse

***MAZDA LAMPS***

**FOR BETTER "SEE-ABILITY"**

# who man the flying guns

**They deserve the best, and they're getting it, these brave young lads who fight it out, high in the sky. Today, in plants equipped for perfect *"See-ability,"* Industry is building amazing new gun turrets for them!**

**Pilot to Crew:** "Fighters at 10 o'clock . . . *coming in fast!*"

And now the show is really on!

But, don't worry—our boys can take care of themselves. Better training, better guns, better planes and equipment—all have lengthened the odds in their favor.

Take those gleaming gun turrets, for example. They're made of plastic, polished and repolished until it's clear and eye-true as air.

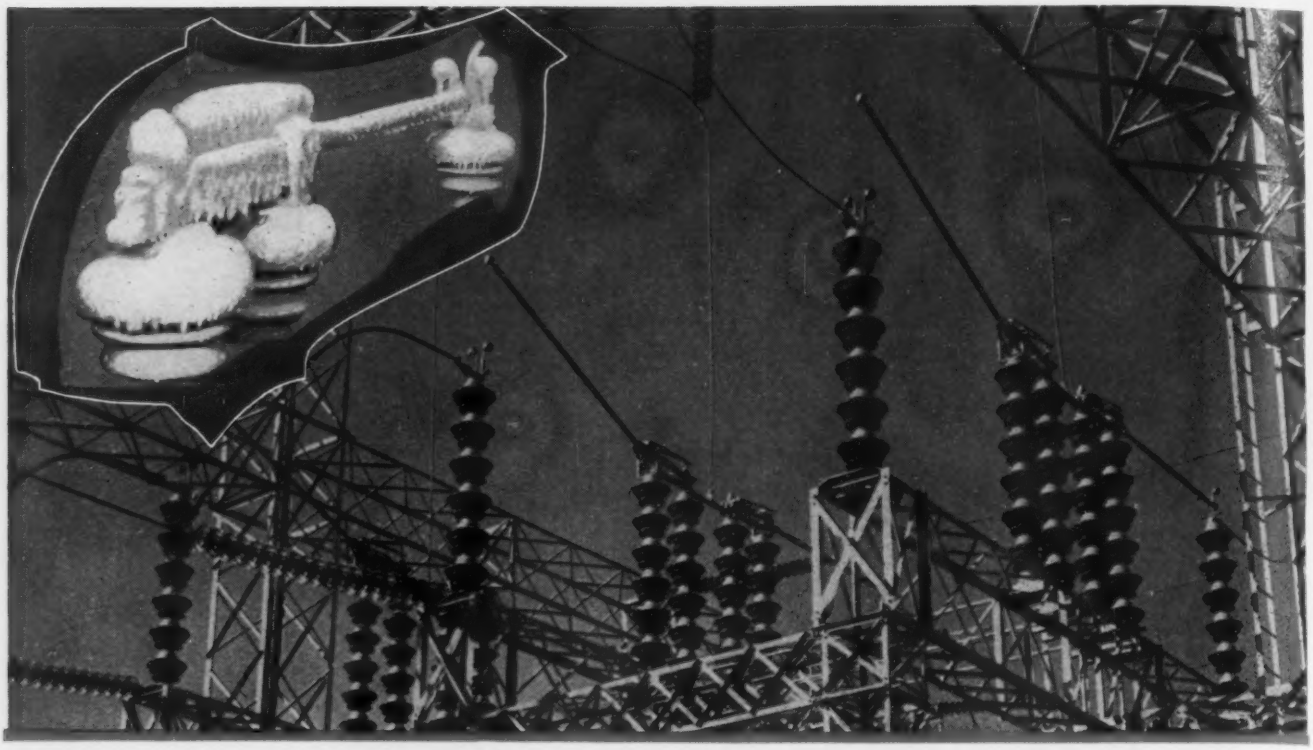
And in many bombers, there are shrewdly positioned inserts of bullet-resisting glass, tough enough to stop a .50 cal. bullet or deflect an aircraft cannon shell!

It's mighty important work—building these turrets. And throughout every step, from shaping the plastic to final inspection, "See-ability," through better, more scientific lighting, is helping men and women combine care and accuracy with speed and—still more speed.

Today Westinghouse Mazda Lamps are bringing better "See-ability" to countless industries. In every field they are helping set amazing new lighting standards for the world of tomorrow!

**Recommend them to your customers.** Constantly improved, Westinghouse Mazda Lamps are brighter, longer-lasting, lower in cost than ever before! Westinghouse Electric & Manufacturing Company, Lamp Division, Bloomfield, N. J. *Plants in 25 cities... offices everywhere.*

KEEP YOUR DOLLARS FIGHTING . . . BUY WAR BONDS



# Sleet-Frozen CONTACTS ..yet Easy OPERATION

## PACIFIC ELECTRIC

### Switch-Blade Rotates before Moving in its Vertical Arc

**Type TW-3; photo shows Special Selector Arrangement, 196-kv., 1200-amps.**

*Where* sleet conditions are bad, here's a Pacific Electric Air-Break Switch that operates easily, even though contacts are frozen solid with ice.

Movement of the operating handle first *turns* the blade and splits the ice at both contact and hinge *before* the blade starts moving in its vertical arc.

When frozen in its open position, the chisel-like blade cuts into and knocks off the ice.

You have no hazardous switch conditions when sleet pulls lines down.

Being counter-balanced, the switch is easy to group-operate at all times. Contacts are of the high-pressure type with silver inserts for full current-carrying ability.

For 37 years the Pacific Electric Mfg. Corporation has specialized in high-voltage switching equipment and were the first to make air-break switches of high voltage for use under all weather conditions. You are assured of long reliability at low upkeep, just as other utilities have experienced the nation over when using Pacific Electric switches of any size.

Ask for full details on these switches which break through ice and operate easily because the blade rotates before moving in its vertical arc.

C. H. Cutter
1015 Securities Bldg.
Seattle, 1, Wash.

G. B. Kirkwood
437 S. Hill St.
Los Angeles, 13, Calif.

J. E. Redmond Co.
448 W. Madison St.
Phoenix, Ariz.

H. R. Slocum
P. O. Box 1920
Honolulu, T. H.

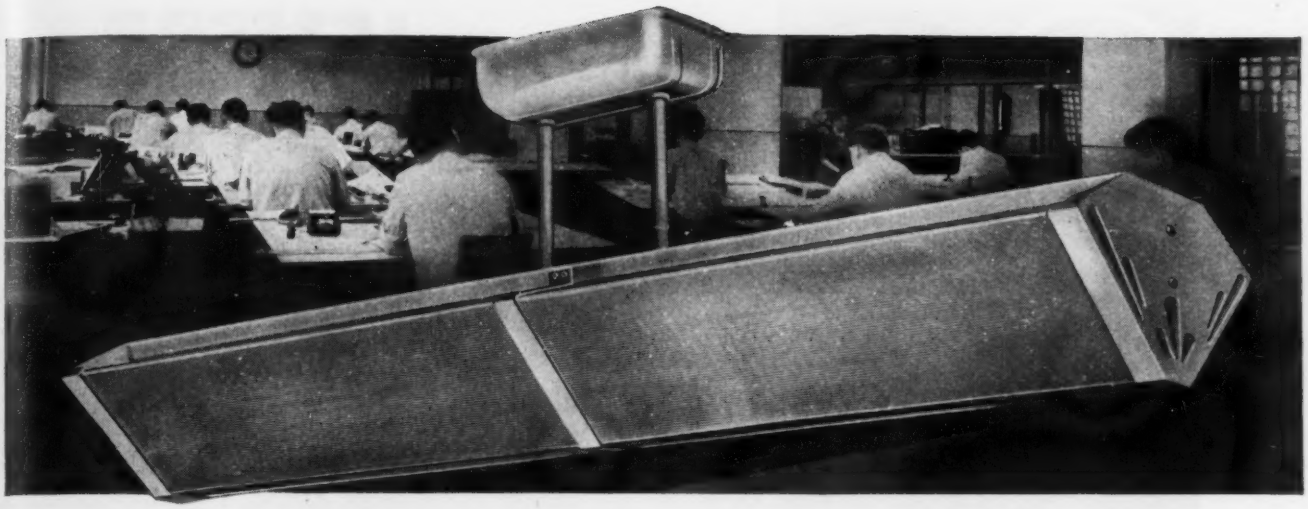
R. Ackerman
318 Dooly Block
Salt Lake City, 1, Utah

Myron Swendsen
P. O. Box 156
Boise, Idaho

Other Representatives in Principal Cities

## Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, 24, CALIF. DUNES HIGHWAY, GARY, INDIANA



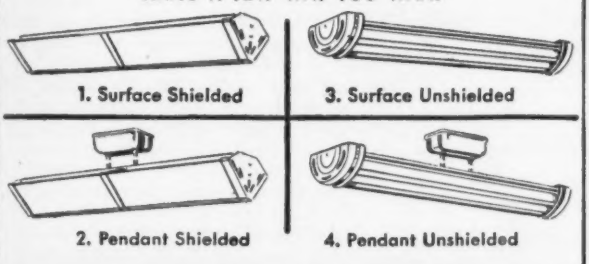
FOR THE FIRST TIME SINCE JUNE 1942

# *an improved fluorescent fixture*

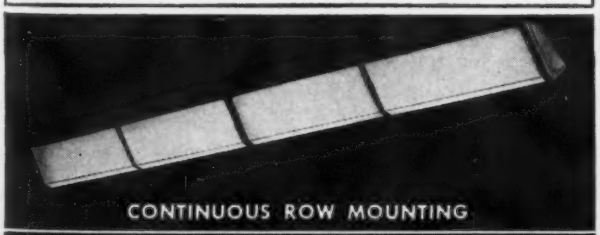
## FOR DRAFTING ROOMS AND OFFICES

**SYLVANIA-ENGINEERED ADAPTABILITY OF THIS NEW FIXTURE**

**HANG IT ANY WAY YOU WANT**



1. Surface Shielded
3. Surface Unshielded
2. Pendant Shielded
4. Pendant Unshielded



CONTINUOUS ROW MOUNTING

INDIVIDUAL MOUNTING

**"EVERYTHING THAT'S FINEST IN FLUORESCENT"**

A RECENT WPB order makes it possible to release this new Sylvania commercial fixture, which offers you outstanding flexibility of installation.

Simple, smart, and modern in design, this new model is ideal for factory offices, drafting rooms, schools, and hospitals.

Its semi-direct light distribution provides real visual comfort through shadowless and glare-free illumination.

Light in weight, easy to install and maintain, it has a relatively small load (200 watts), which is seldom heavy enough to require the rewiring of existing circuits.

And you get a complete, pretested package of light — with 40-watt Sylvania Lamps, Mirastat Starters, and high-power-factor Dualamp auxiliary — completely wired and ready for installation.

This model — unshielded C-200R and shielded C-201R — is available to you on a priority of A-1-J or better, with specific WPB approval required for continuous row installations. It carries Underwriters' Laboratories inspection label and Sylvania's own guarantee. Write for further details, specifications, and prices.

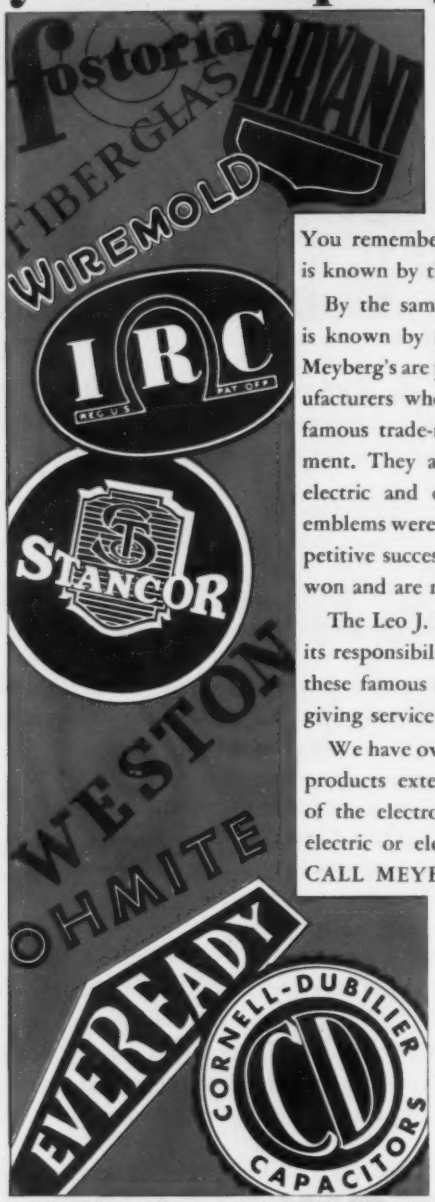
# SYLVANIA

## ELECTRIC PRODUCTS INC.

**Ipswich, Mass.**

*INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, OTHER ELECTRONIC AND ELECTRICAL DEVICES*

**A man is known by the company he ~~keeps~~ *represents***




You remember the wise old saying that a man is known by the company he keeps.

By the same token we say that a distributor is known by the company he *represents*. We at Meyberg's are proud of the nationally known manufacturers whose lines we stock. Some of these famous trade-marks are shown in this advertisement. They are the brand names of leaders in electric and electronic merchandise. And their emblems were made famous through years of competitive success—reputations that were not easily won and are not lightly held.

The Leo J. Meyberg Company is well aware of its responsibility in handling merchandise bearing these famous names. We try to do our share by giving service to the best of our ability.

We have over 500 lines of manufacturers whose products extend over the full frequency range of the electromagnetic spectrum. In matters of electric or electronic supplies we invite you to CALL MEYBERG FIRST.

**LEO J. MEYBERG CO.**
*Incorporated*

In SAN FRANCISCO, 70 Tenth Street, Zone 3 TELEPHONE UN 1212
In LOS ANGELES, 2027 S. Figueroa Street, Zone 7 TELEPHONE PR 6011

MOST COMPREHENSIVE INDUSTRIAL ELECTRIC AND ELECTRONIC STOCKS IN THE WEST

# LETTERS
## *to the editor*

To the Editor:

I have just read *A Lighting Design Check Chart* by Mr. Dearborn in the September 1943 issue of Electrical West and it is refreshing to see an article on illumination written by a practicing industrial engineer. Most articles on illumination are written by sales representatives and patently are trying to sell the wares of the author, and you editors must often have to decide on whether to accept some sales story or hurt the feelings of a pet advertiser.

I feel like saying "Hear! Hear!" or "Amen" to many of Mr. Dearborn's short concise statements, e.g., "Satisfactory general practices which have withstood the test of time" means actual good practice in the particular industry and not wishful thinking of an equipment salesman—a point well taken and weeds out the impractical. I know of some recent jobs which are salesmen's dreams come true—at the taxpayers' expense—which have become operating problems which would have been ruled out by Mr. Dearborn's 1-A-(1).

Item II is a fundamental, the neglect of which leads to silly recommendations because the one who actually designs the lighting and electrical systems must be acquainted with the details of the manufacturing process before he can decide whether "chipping" needs 10 or 50 f-c and whether it must be secured from local lights or from high-bay lights.

Mr. Dearborn really drove the nail home when he stated: "It should be possible to justify any properly designed lighting system upon a realistic, practical basis." Other things being equal, the installation which shows the lowest yearly operating cost (including overhead) is the best one.

Yes, I enjoyed Mr. Dearborn's article very, very much and have kept it for others to read who are about to decide on a lighting system on the basis of mob psychology.

D. H. Tuck.
Electrical Engineer,
Holophane Co., Inc.

New York, N. Y.

To the Editor:

We would like to point out an error made in the Tri-State story which ran in your latest issue. The picture of the new Seattle manager should have been captioned "R. C. Cairns," instead of "C. F. Bowers" as it was listed. Mr. Bowers is president of the three corporations and consequently when the story was run listing his appointment as the new Seattle manager, he received quite a few calls congratulating him on his new position.

To further complete the story of the Tri-State organization, Mr. A. Howard is manager of the Los Angeles office; Mr. Bert Deleray is manager of the San Francisco office. . . .

Ford C. McElligott.
Account Executive
The McCarty Co.

Los Angeles, Calif.

Editor's note: Electrical West apologizes for this case of "mistaken identity" in its November issue.

# MISSING

## ...yet still in action

For years, Manson Tape has occupied the highest position of all friction tapes. Whenever the utmost safety and permanence in splice protection was required, Manson Tape became the first choice of experienced engineers and electricians. Purchasing agents, too, willingly paid more to get lasting protection.

Contributing to this fine reputation of Manson Tape was the pledge of The Okonite Company to use only the best materials in its manufacture. One of these materials was a special type of natural rubber, which thoroughly impregnated and coated the strong, closely-woven cotton fabric. The exclusive use of this special type of new rubber was one reason why Manson Tape was unequaled in true adhesiveness and in aging and weathering qualities.

Today, with *all* new rubber forbidden for this use, the manufacture of Manson Tape has been temporarily discontinued because, if made with the materials currently available, Manson Tape would not have the superior characteristics nor be of the same high quality that you have always known.

As an assurance to the thousands of electrical men who have so consistently used it, we remind them that older joints and terminals made with Manson Tape will stay protected for years to come. To those who are fortunate enough to have available a supply of Manson Tape, we suggest it be reserved for the most important jobs.

**UNTIL MANSON TAPE IS AGAIN AVAILABLE**

We recommend as an alternative, *Dundee "A" Friction Tape* which fully complies with all current Federal and A.S.T.M. emergency specifications.

**THE OKONITE COMPANY**

PASSAIC OKONITE NEW JERSEY

3436

*MANUFACTURERS OF INSULATED WIRES, CABLES AND TAPES SINCE 1878*

HERE'S A WARTIME INVESTMENT WITH A

# Great Future!

Today — you need the uniformly high voltages made possible, without excessive use of copper, by Allis-Chalmers ⅝% Step Regulators. Tomorrow — their finer engineering will pay you lasting dividends in longer life and lower upkeep!

"WILL IT HELP win the war?" is the question asked today when new equipment is considered. For Allis-Chalmers ⅝% Step Regulators the answer is "Yes!"

Remember, there are two ways you can boost faltering voltages today . . .

First, by rebuilding feeders or installing new ones — costly in copper and time.

Second, by using a regulator instead — *saving thousands of pounds of copper and precious man hours!*

Get the full story on finer voltage regulation from our nearby A-C district office. Write for Bulletin B6056A. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS. *A* 1650

**WHY ENGINEERS PICK ALLIS-CHALMERS ⅝% STEP REGULATORS**

**1. Closer Regulation** — ⅝% half-cycling steps plus "Feather-Touch Control" permit settings within ± ⅝%.

**2. Minimum Maintenance** — No holding or braking devices. Oil immersed moving parts.

**3. Longer Contact Life**— Not a single contact has ever been replaced due to deterioration under normal operation!

**4. Lower Exciting Current** — Needs only ⅓ the exciting kva required by older regulators!

**5. Fewer Bolted Connections** — Unit construction eliminates 78 bolted connections.

A-C WE WORK FOR VICTORY WE PLAN FOR PEACE

# ALLIS-CHALMERS ⅝% STEP REGULATORS

# *Two Symbols*

## THAT STAND FOR EXCELLENCE

TO ONE—
A STAR HAS BEEN ADDED
FOR SERVICE TO COUNTRY

TO THE OTHER
—A CENTURY OF SERVICE
TO CUSTOMERS

The traditionally high standards of exacting quality, excellence and service are the priceless ingredients upon which Hubbard and Company has established and maintained its reputation for outstanding leadership. One hundred years of continuous service bears mute evidence of the ability to serve customers and to keep serving them well. In recognition of Hubbard's continued Excellence in serving our Country's urgent war needs—a star has been added to the original Army-Navy "E" award for "work well done." In war as in peace there's no substitute for experience.

**HUBBARD POLE-LINE HARDWARE INCLUDES:**

- ★ STANDARD POLE-LINE HARDWARE
- ★ COMMUNICATION SYSTEM HARDWARE
- ★ ELECTRIC RAILWAY HARDWARE
- ★ INSULATOR PINS
- ★ POLE TOP FIXTURES AND STEEL CROSS ARMS
- ★ STRAIN INSULATORS AND CLEVISES
- ★ HIGH TENSION MATERIAL
- ★ SECONDARY RACKS AND ACCESSORIES
- ★ POLE AND CROSS ARM BRACKETS
- ★ STREET LIGHTING EQUIPMENT
- ★ RURAL ELECTRIFICATION MATERIAL

HUBBARD

# Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

HANG THE LOAD ON HUBBARD HARDWARE

HUBBARD

1230 Sixth Avenue · Rockefeller Center · New York 20, N. Y.

UNITED STATES

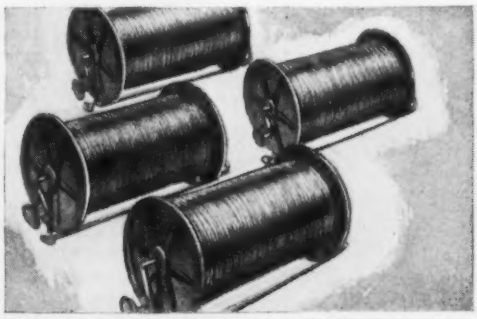
# Miles from nowhere —but the message gets through

He'd crawled, run, crawled again. Now he was far ahead of his company... into enemy territory... surrounded... cut off completely from American forces except for a strand of lightweight wire... Laytex Assault Wire.

*But his messages got through surely and clearly... made possible a successful advance.*

Laytex Assault Wire is made expressly for jobs like this. It's extremely lightweight... yet tough enough to be used by advance scouts.

The use of such lightweight small diameter wire is possible only because the insulation is of such high quality—has high resistance to moisture, withstands a wide range of temperature changes and does not become embrittled when subjected to vibration and shock. Laytex Assault Wire has a talking distance of over five miles.



**LIGHTWEIGHT** Laytex Assault Wire weighs only thirty pounds per mile. This means that an advance scout can carry ample wire while pushing ahead.

**SPECIALLY DEVELOPED** for front line service, Laytex Assault Wire is hard at work in Europe, Asia, the South Pacific.

**LAYTEX ASSAULT WIRE** is unaffected by moisture or temperature changes because of the high quality of the insulation. This means it can be laid and used successfully regardless of climate or terrain.

**FIVE MILES LONG**—but messages get through clearly. Laytex Assault Wire, tested and retested for quality, has a proven talking distance of more than five miles.

# RUBBER COMPANY

# ANOTHER G-E *Watch Dog** STARTER

**THE FS-100**
**—for 100-watt Fluorescent Lamps**
**(Similar to FS-40 Watch Dog starter for 40-watt lamps)**

## Big Aid to Fluorescent Lamp Maintenance

For months now G-E Watch Dog starters in use in war plants have been providing efficient economical protection for 40-watt fluorescent lamps. They're saving many manhours of maintenance time. They're completely eliminating the annoying blinking of dead lamps.

Now this protection is extended to war plants using 100-watt lamps. The new FS-100 Watch Dog starter will guard 100-watt fluorescent lamps in the same efficient way the FS-40 Watch Dog starter guards 40-watt lamps. Both Watch Dog starters make caring for fluorescent lighting easy.

For further information see the nearest G-E Merchandise Distributor or write to Section G1137-18, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

*Reg. U.S. Pat. Off.

**GENERAL ELECTRIC**


# BOOKS
## *you may want*

RADIO ENGINEERS' HANDBOOK, by Frederick Emmons Terman, 1,019 pages, index, many tables and illustrations, 6½ x 9, McGraw-Hill Book Co., $6. This is an exceptionally thorough reference book on all phases of high frequency engineering, compiling under one cover, a very complete collection of formulae and data. The chapters include material and data for mathematical tables and formulae, circuit elements, circuit theory, vacuum tubes and electronics, their application as amplifiers and oscillators, modulation and demodulation, power supply, antennas, propagation of radio waves, radio aids to navigation and measurements. Footnotes give references to published articles on the subject discussed.

This handbook does not include co-ordinated material describing television; however, certain basic data pertaining to television, such as amplifiers, wave guides, antennas, ultra-high frequency oscillators, are provided. The chapter entitled, *Vacuum Tubes and Electronics*, gives much reference material on the subject of electron optics, electron lenses and cathode-ray tubes.

This is an excellent reference book for all persons engaged in electrical research and design, but is particularly valuable to those working in the high frequency or ultra-high frequency field. An author index is included, together with the page number referring to the published material.—F.S.B.

HYPER AND ULTRA-HIGH FREQUENCY ENGINEERING, by Robert I. Sarbacher and William A. Edson, 644 pages, 6 x 9, illustrated, John Wiley & Sons, $5.50. The hyper and ultra-high frequencies as referred to in this book include the range from 30 to 10,000 megacycles per second. The sensational developments and military applications of new techniques in this portion of the electromagnetic wave spectrum have led to a widespread interest in the subject. Such attention would have been well deserved even in time of peace, for we are in a period of advancement in the communications field comparable to that of the early twenties when the radio age was being ushered in.

So different, however, in comparison even with radio frequencies, is the character of circuit behavior for these wave lengths (down to a few centimeters in length) that a different mathematical approach is required and the methods of radio engineering are only partially applicable. A return to the fundamental concepts of Maxwell's field equations and comparisons with the laws of optics have been found advantageous. That is the approach followed by Sarbacher and Edson. The first two chapters of their book are a review of the fundamental units and mathematical definitions of electrical phenomena. Following this is a discussion of electromagnetic wave theory including such topics as propagation, polarization, Poynting vector, reflection and refraction.

The middle portion of the book contains a very thorough development of wave guide theory and covers all of the commonly encountered guide shapes. One chapter is devoted to a description of wave guide laboratory equipment. Methods of filtering, detecting, and converting different types of

(Continued on Page 18)

# KEARNEY TRIP-O-LINK FUSE SWITCH

## Gives You a NEW CARTRIDGE with each Re-fusing

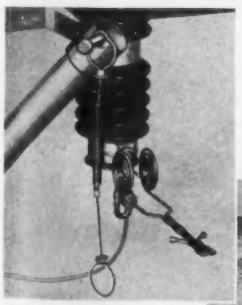
YES — actually a new cartridge every time you replace a fuse, because the KEARNEY TRIP-O-LINK is a cartridge and fuse link combined. The dimensions of the bakelite covered fibre tube have been scientifically determined to extinguish power arcs at the first current zero.

Measurable amounts of the fibre liners of all cartridges are burned away with each operation, the degree of burning depending upon the amperage and duration of the arc. Hence in ordinary designs fibre dissipation limits the cartridge life because the fibre liner is the sole arc-extinguishing agent in any fibre-lined cartridge. Gradual deterioration, charring and weathering through years of exposure also has its effect on the fibre of a permanent cartridge. This may explain why a fuse switch can operate successfully for years and then for no apparent reason fail to interrupt a low amperage fault.

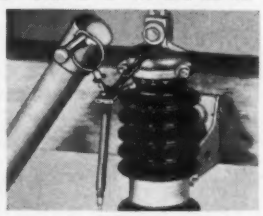
Make sure that your protective devices are not subject to these limitations by using the KEARNEY TRIP-O-LINK fuse switch. A fresh, new, full-dimensioned fibre liner comes as an integral part of each link making your TRIP-O-LINK ready for whatever fault may come down the line.

*It's Easy to Fuse*

## TRIP-O-LINK SWITCHES

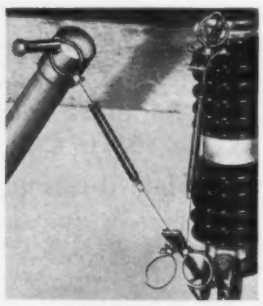


1 *Place top loop of link on puller arm of stick.*



3 *Raise top of fuse link into top V-groove contact and pull securely.*

2 *Place bottom of fuse link body (not loop) into lower V-groove contact.*



4 *Showing double V-groove contacts which permit fuse inspection without service interruption.*

WRITE FOR COMPLETE OPERATING DATA AND PRICES

**JAMES R. KEARNEY CORPORATION**

4236-42 CLAYTON AVE. (10) SAINT LOUIS, MISSOURI

# LIGHT
## CLOSE TO THE WORK

Better lighting is a "must" in industry today — a means of attaining smoother, faster production after every other production aid has added its push.

BullDog Universal Trol-E-Duct makes possible that better lighting — brings the light right to the work — makes it easy to move or rearrange lights, or entire lighting systems, at any time and without interfering with production.

UNIVERSAL Trol-E-Duct

# POWER
## CLOSE TO THE TOOL

Don't waste valuable production time while workers look for power outlets for portable tools. Don't risk accidents due to tripping over long cords, or short-ing tangled cables.

Bring the power right to the job with BullDog Industrial Trol-E-Duct—the system that not only fur-nishes mobile power, but also support, for portable tools.

INDUSTRIAL Trol-E-Duct

**BULLDOG**
**ELECTRIC PRODUCTS CO.**

Box 177, R. Pk. Annex
Detroit 32, Michigan
Bulldog Electric Products of Canada, Ltd., Toronto, Ontario
Field Engineering Offices in All Principal Cities

MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Breakers and BUStribution SYSTEMS.

You SAVE What You SPEND for WAR BONDS

BullDog Universal Trol-E-Duct *for light,* and Industrial Trol-E-Duct *for mobile power,* are both furnished in standardized, interchangeable sections. Both are completely salvable, suitable for quick removal to a new department or to a new plant.

Ask for complete illustrated bulletins Nos. 425 and 407, describing these two time and money saving, production speeding, BullDog systems.

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

**Coast Electric & Manufacturing Co.**
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Portland, Oregon, Tel. Garfield 2844

**Safety Switchboard & Manufacturing Co.**
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

**Mullenbach Electrical Manufacturing Co.**
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224

# mine motor rebuilt . . .

## IN 2½ DAYS

FAILURE OF 400 HP, 1,200 RPM SYNCHRONOUS MOTOR DRIVING MINE FANS THREATENED PROLONGED SHUTDOWN OF OPERATIONS. MOTOR DELIVERED TO WESTINGHOUSE DISTRICT MANUFACTURING & REPAIR PLANT 10 P.M. TUESDAY. STATOR COMPLETELY REWOUND, FIELD COILS CLEANED AND REPAIRED—MOTOR REASSEMBLED, TESTED, PAINTED. BACK ON THE JOB BY 3 P.M. FRIDAY.

**Westinghouse**

DISTRICT MANUFACTURING AND REPAIR

J-90492

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

## EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

**SAVES TIME-SAVES EYES SAVES STEEL**

**IMPORTANT SAVINGS IN INSTALLATION AND SERVICING TIME**

Designed for fast mounting in continuous rows, with knockout entrys on back and end of channel. Channel construction facilitates straight-through wiring. Starters easily accessible on side of channel. Easily removable reflector.

**HIGH LEVEL LIGHTING SAVES EYES, PROMOTES EFFICIENCY**

Three-lamp unit in continuous runs gives high level, low-glare lighting. Efficient reflector finish is easily cleaned to maintain high light output. High power-factor ballasts.

**WARTIME DESIGN SAVES STEEL — REDUCES WEIGHT**

Masonite reflector is smooth, and sturdy. Clean design throughout gives full enclosure of wires and wiring devices without excess metal. Smoot-Holman "Sight-Craft" standards means long-lived construction.

**TYPES — Sizes to Fit Your Needs**

MM-2461—2 40-watt lamps—48″
MM-3461—3 40-watt lamps—48″
MM-2661—2 100-watt lamps—60″

SMOOT HOLMAN COMPANY SIGHT-CRAFT INGLEWOOD CALIFORNIA MADE IN U.S.A.

**From Your Local Graybar Office**

As a part of its all-inclusive service on industrial lighting, GRAYBAR offers the "Metal Miser", backed up by competent application aid. Whatever your lighting need, put it up to your local GRAYBAR Representative.

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Executive Offices: GRAYBAR BLDG., NEW YORK 17, N. Y.

Bringing together more than 200 manufacturers . . . 20,000 customers

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Everything Electrical . . . . THAT IT TAKES TO WIN!


waves are discussed. Transmission line theory of electrically long lines follows the wave guide discussion. Some of this section, for example the important topic of impedance matching by line stubs, is adequate in a descriptive way but lacking in mathematical analysis. A chapter each on the subjects of cavity resonators and horn radiators concludes the wave theory and applications section of the book.

The remaining half dozen chapters deal, somewhat sketchily at times, with the various aspects of electronic circuits and equipment for generation, amplification, receiving and detection of hyper and ultra-high frequencies. While the treatment of the limitations of ordinary vacuum tubes at high frequencies and of the methods of compensation is adequate, the material on negative grid oscillators and velocity modulation tubes is quite brief.

The shortcomings of the latter part of this volume as compared to the very complete development of wave and wave guide theory in the first and middle sections must be viewed as arising from the censorship imposed by wartime conditions. Considering this limitation, the authors have done an excellent job of producing a well-coordinated text covering the basic theory and developments of hyper and ultra-high frequency engineering.—W. R. J.

CIRCUIT ANALYSIS OF A-C POWER SYSTEMS, Volume One, Symmetrical and Related Components, by Edith Clarke, 540 pages, appendix 40 pages, index, many figures, tables and illustrations. 6 x 8¾, John Wiley and Sons, $6. Symmetrical components have become a necessary mathematical working tool for all those engaged in a-c power circuit analysis. A knowledge of this subject requires a certain dexterity in the manipulation of vectors, complex quantities and operators. This book is written for the student and engineer who must be able to solve problems of electrical conductor short circuits, conductor open circuits, voltage regulation and other problems involving multi-phase unbalanced circuit conditions.

In addition, certain other mathematical operators designated as the Alpha, Beta and Zero components of three-phase systems are clearly described so that the engineer can determine their peculiar value for certain types of circuit problems, and examples are provided to demonstrate their use.

Other chapters discuss the various impedances of overhead lines, such as sequence self and mutual impedances of single-phase, two-phase and three-phase circuits, Zero-sequence impedance of multi-circuit lines, capacitances of overhead lines.

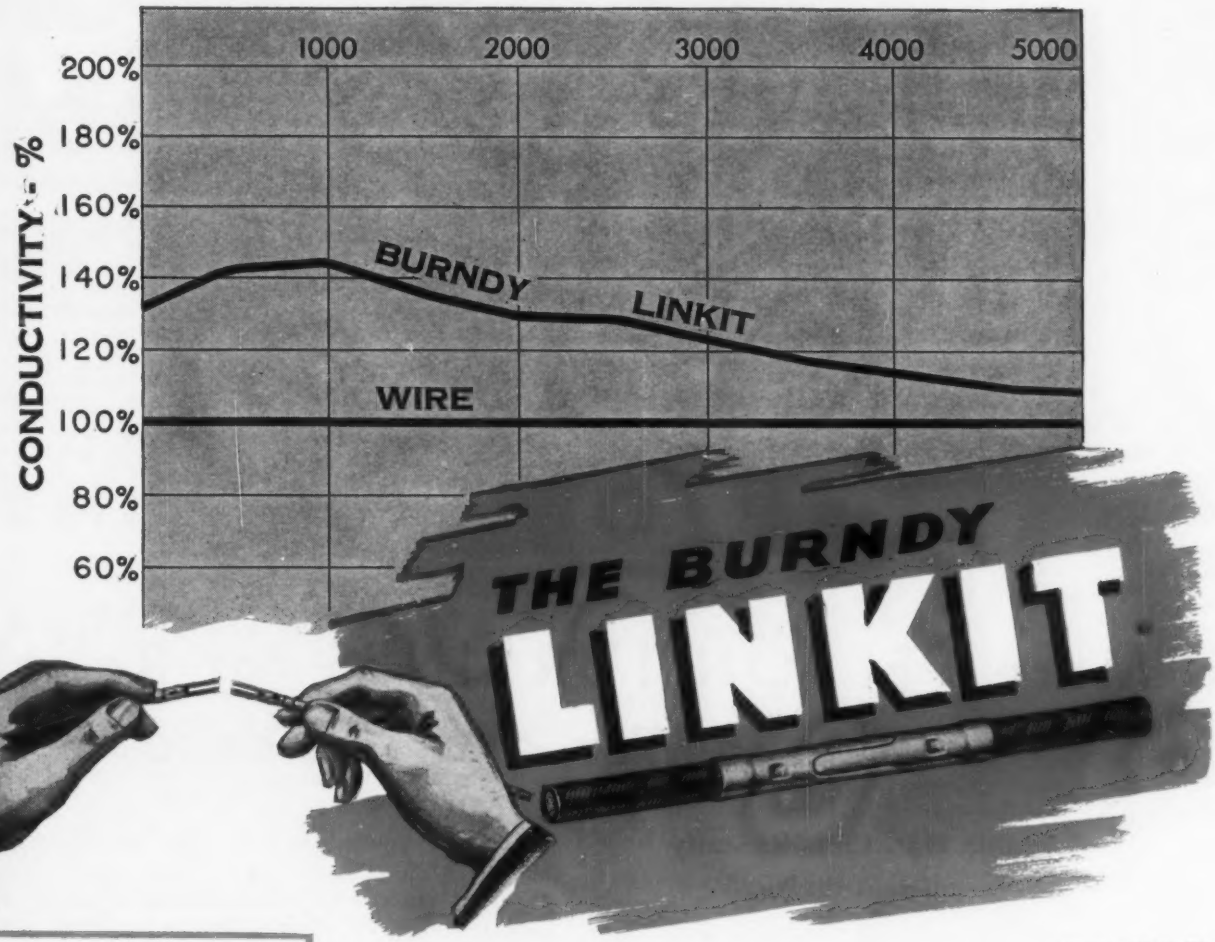
An extensive appendix is included and is divided into two sections. Section A reviews the solution of determinants, and Section B is an arrangement of tables, data and charts that are helpful for solving overhead transmission circuit problems.

This is an excellent treatise on the subject of symmetrical component theory and application. Many problems are given; some are solved to show the method of attack; others are left for the reader to solve. The book is valuable to students and engineers alike as a textbook and a reference book. An extensive bibliography is included at the end of the chapter.—F.S.B.

CABLE OPERATION, 1941, a report published in September 1943 by Edison Electric Institute, 420 Lexington Ave., New York, 17, 21 pages, 50 cents (members), $1.25 (nonmembers) in U.S.A.

# After 5000 makes and breaks

## RELATIVE WIRE CONDUCTIVITY is still 110%!



Patent No. 2,109,837

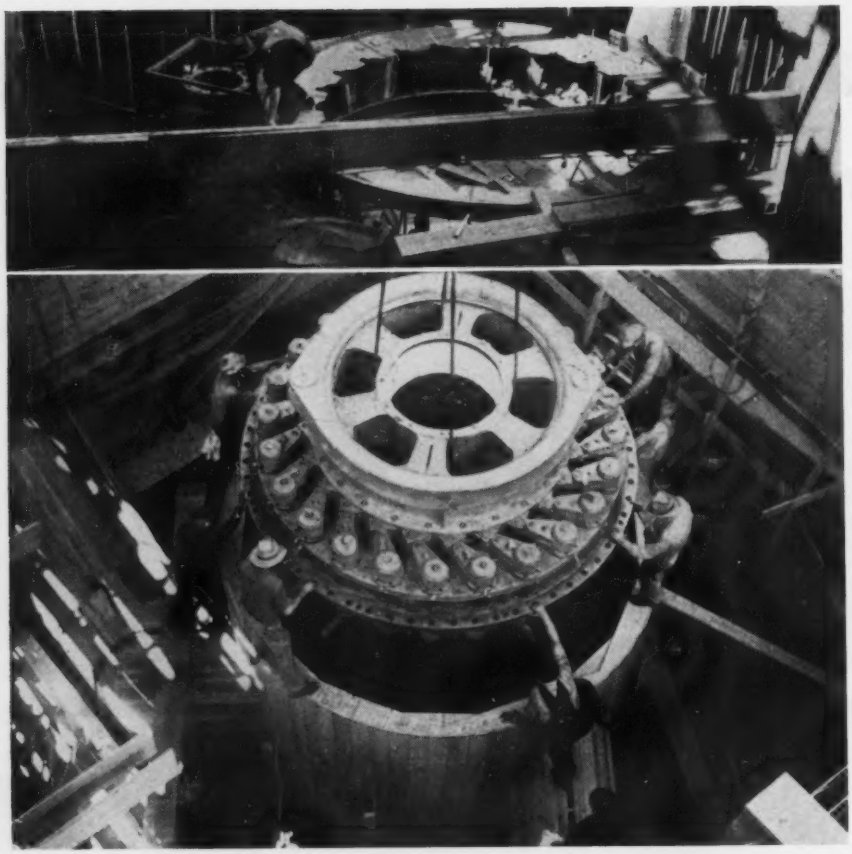
### THE DETACHABLE CONNECTOR WITH NO LOOSE PARTS!

This is the test that wins *instant approval* for the Burndy LINKIT! For even 100 makes and breaks would be *extreme service* for a small wire connection. Yet the LINKIT withstands *thousands,* with little effect on conductivity . . . proof of the *enduring strength* and *wearability* of its four *long* contact surfaces.

Remember, too, that each half of the LINKIT is identical . . . and there are no extra parts to loosen or lose. The halves are quickly and securely indented to the wires with Burndy HYTOOLS in the usual way. LINKITS and LINKIT lugs are available for all wire sizes from #22 up. Literature gladly sent on request.

**BURNDY ENGINEERING CO., INC., 107 Eastern Blvd., New York 54, N.Y.**

**BURNDY** *Headquarters for Connectors*



# 4 More PELTON TURBINES for Reliable Power *in War and in Peace*

### 50,000 H.P. Units Recently Installed at Pit No. 5

Here is one of four Pelton Turbines being installed at the P. G. and E. Pit No. 5 hydro-electric power house.

The top photo shows the scroll casing ready for imbedding in concrete. The lower, shows the guide vanes and head cover being placed into the scroll case. Guide vanes direct the water to the turbine runner which spins in the center.

When peace comes, these reliable prime movers will continue their efficient service, for Pelton Turbines last a long age with little upkeep.

For 63 years Pelton has pioneered and consistently improved hydraulic turbines and their control equipment. Many of the largest power projects have relied upon Pelton Turbines all through these years.

**THE PELTON WATER WHEEL COMPANY**

***Hydraulic Engineers***

**2929 NINETEENTH ST., SAN FRANCISCO, 10**

**EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, Baldwin-De La Vergne Sales Corp., Woodward Governor Co. and Cone Valve Division, Chapman Valve Mfg. Co.**

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BLW THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

FOR THE **LONG PULL** TODAY . . . AND THE **STRONG PULL** TOMORROW

# healthy electrical arteries

TRUMBULL-PIONEERED

AERATED L.V.D. LOW VOLTAGE DROP

FEEDER SYSTEMS

**CAPACITY PLUS FLEXIBILITY.** Ample power capacity . . . with what, in effect, is a "switchboard running the length of the plant" . . . combined with flexibility in initial layout and subsequent ease in adding or relocating equipment that is essential to future planning.

**"PACKAGED" UNITS** mean that costly and time consuming "special" engineering work in plant power distribution layout is eliminated. Standardized "stock" sections are quickly and easily installed. Efficiency, safety and performance have been predetermined.

**TRUMBULL ENGINEERING** pioneered the development of Standardized Enclosed Bus Bar Distribution Systems. Trumbull "Aerated" L.V.D. represents the successful solution of difficult technical problems in combining high current-carrying capacity with ability to withstand electrical and mechanical stresses, and assurance of long-term safety and freedom from maintenance. Entire structure is rigidly braced. Improved Vystipe bus bar connectors have silver plated joints.

**DELIVERS FULL VOLTAGE** . . . L.V.D. . . . Low Voltage Drop . . . means *maximum* power delivery throughout the system . . . your answer to needed extra power capacity. Heat-dissipating ventilated enclosures house bus bars that are individually encased in high temperature resisting CARBONOT sheaths.

**SAVES CRITICAL MATERIALS.** "Aerated" L. V. D. conforms to W. P. B. Limitation Order No. L-273, uses minimum copper and steel for a given capacity without sacrifice of efficiency. Ratings, 250, 400, 600, 800, 1,000, 1,350, 1,600 and 2,000 amps. Short Circuit ratings up to 100,000 R. M. S. Amps.

TRUMBULL

**ENCLOSED BUS BAR DISTRIBUTION SYSTEMS**

**INTERCONNECTS** with Trumbull Systems already installed and with Trumbull FLEX-A-POWER Systems providing secondary feeder distribution with plug-in connections to machine load. Complete range of FLEX-A-PLUGS includes switching and protective devices as well as CAPACITOR Flex-A-Plugs for efficient power factor correction *at point of load.*

Write for Trumbullaid Bulletin 408, for detailed information and illustrations.

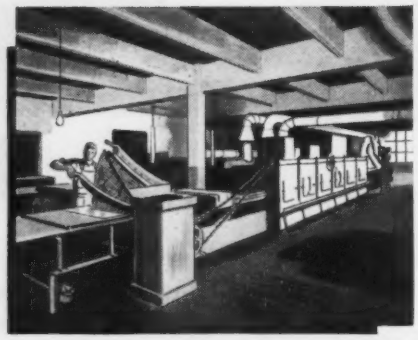
THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

# Birth of a kilowatt

**BEFORE CURRENT** can surge through copper segments someone has to worry about faultless insulation between those segments. Mica, Insulation Headquarters takes care of that for you—beginning with pure, raw mica from our own mines — richest deposits in the world.

**SKILLED NATIVES** trim and split this raw mica into thin splittings (one thousandth of an inch) ready for shipment to our plant where they are built up in a wide variety of Micanite electrical insulations.



**CONTINUOUS** automatic layer machines combine the splittings with cement — the first step in forming sheets from which Micanite commutator segments and other flat shapes are made.

**THERE'S NO DELAY** in securing segments and other built-up mica parts today. Modern equipment at Mica Insulator is ready to go to work for you — following your exact specifications, fabricating and molding to minute tolerances — quickly.

GENERATOR RECONDITIONING time may be a stumbling block for peak, wartime power generation, especially when odd-shaped, unusual-sized segments and rings are needed for unusual commutators! But Insulation Headquarters is fortified against such delays with complete equipment —to cut and mold the Micanite parts you'll need to keep those generators humming. For another time-saver, order all of the electrical insulations you'll need for transformer, motor and cable repair work—at the same time.

*Mica Insulator Company*

ANGUS-CAMPBELL, INC., *(Factory Representative to Mica Insulator Co.)*,
2122 — 4th Ave., SEATTLE. 449 S. San Pedro St., LOS ANGELES.
235 San Bruno Ave., SAN FRANCISCO


# PRODUCTS

*that are news*

## Portable Unit (1200)

Square D Co. is manufacturing a portable transformer and distribution cart for production and assembly plants and outdoor assembly work requiring 110-volt electrical supply to portable hand tools and lighting equipment. This waterproof unit is constructed of galvanized steel and is mounted on four-inch castor wheels. The cabinet contains a 440/115-230-volt transformer, a 2,510-

W5 motor starter and a 12-circuit multi-breaker load center. Additional 440-volt subfeed outlets and 110-volt plug-in receptacles on the sides of the cart are protected by weatherproof hoods. A top-deck rack and support hooks are provided.

## Electric Tachometer (1201)

Ideal Commutator Dresser Co. is offering a self-energized electric tachometer, which it states can be used either as a hand or separable type. It consists of a small generator coupled electrically to an electric meter.

The generator is a small, permanent "Alnico" magnet rotor mounted on precision sealed ball bearings and said to be capable of continuous operation at any speed within the limit of the meter. The rectifier type meter is designed to withstand momentary overload up to four times the maximum speed indication. Two scales, "Hi" and "Lo", are provided. The generator and meter may be used together as a hand type tachometer or may be separated and connected by a two-conductor electric cord.

Complete unit, including ¾-in. shaft extension, is 3 x 7½ x 2½ in. and weighs 3 lb. It is available in two sizes for 0 to 2,500 rpm. and 0 to 5,000 rpm.

## Frequency Meter (1202)

J-B-T Instruments has designed a new 400-cycle vibrating reed frequency meter, which it claims has a longer reed mount than other models for lower frequencies and in which both driving coil and permanent magnets are placed near the outer limit of the free ends of the reeds. According to the manufacturer, power consumption is low, and the unit, when once calibrated at the factory, requires no adjustments in the field, is easy to read and not affected by wave form, normal temperature change or external magnetic fields.

# How One Power Company Got Another 100 Kw from an Overloaded Feeder for a New Airport

**PROBLEM.** A small airport in the South needed 2300-volt service, the total estimated peak demand being 100 kw. The power company that serves the area had a 2300-volt distribution feeder, but it was already loaded to the point of causing trouble. This feeder originated at a substation on an 11-kv circuit at a point about 15 miles from the generator.

**SOLUTION INCLUDED USE OF INDUCTION REGULATORS.** In order to carry the new airfield load, the company extended the 11-kv feeder about 4¼ miles, to a point where the 2.3-kv feeder branched and continued in two directions. At this point, three G-E 75-kva transformers and *TWO G-E 12-KVA 2400-VOLT INDUCTION REGULATORS* were installed. The regulators not only made it possible to supply the airfield with the power required, but also improved voltage conditions on the two 2300-volt branch lines.

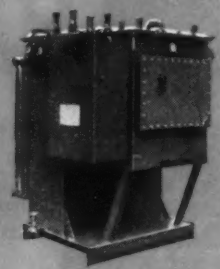
## SAVINGS IN MATERIAL AND TIME

Improvement in regulation was needed because of the small conductors installed in this area. If regulators had not been used, it would have been necessary to extend the 11-kv feeder all the way to the airfield—by changing over a considerable portion of 2300-volt line to 11 kv. This alternative would have required a much greater expenditure of the critical materials so sorely needed for other war needs. Also, the ready availability of G-E feeder regulators and their ease of installation made the use of regulators the quickest method of doing the job.

If you need additional capacity, ask your G-E representative to estimate the savings in time and critical materials that can be obtained on your feeders with G-E feeder regulators, or write for Bulletin GEA-2730. *General Electric Company, Schenectady, N.Y.*

**BUY WAR BONDS**

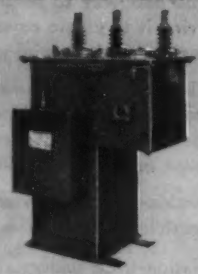
One of a series telling of wartime distribution problems being solved with G-E feeder regulators—applications where they saved critical materials or otherwise helped the war effort, like some jobs you may have.



THREE-PHASE STEP

SINGLE-PHASE INDUCTION

SINGLE-PHASE INDUCTION



SINGLE-PHASE STEP

DRY-TYPE INDUCTION

GENERAL ELECTRIC

404-32-5400

FEEDER REGULATORS

This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.

# *Have you ever been out of a job?*

## What you can do

The best way to insure good jobs and better living is to create an environment favorable to continuous industrial progress.

The best way to insure healthy industrial progress is through a nation-wide understanding of the fact that we live better through doing more work in less time.

Nation-wide understanding of that fact will result in laws that encourage industrial progress.

Nation-wide understanding always will be a will-o-the-wisp, unless each business man does his share of: (1) Understanding his own responsibilities in maintaining industrial progress; (2) Explaining the relation between *good* business and good living to his employees and neighbors.

The newspaper advertisement reprinted here is McGraw-Hill's share in the job of explaining the source of good living. It has appeared in Washington, New York and Chicago, as well as in all McGraw-Hill publications. It is available, for use over your own company signature, in your plant city. A mat, six-column size for newspaper reproduction, will be sent to you upon request. Booklet reprints are also supplied at cost ($10.00 per thousand).

James H. McGraw, Jr.

President

McGraw-Hill Publishing Company, Inc.

IF you have ever been out of a job, and if you had a wife, children and slender resources at the time, then the fattest paycheck will never quite obscure the memory of the days and nights you lived with fear.

Some of that fear lingers in every man's mind, for all have suffered in some degree.

► That's why you hear the words "postwar planning" so often. Americans are determined that, one way or another, they are going to keep our thousands of factories going after the war, so that there will never again be a vast army of unemployed.

As usual, in a democracy, there are two entirely different ideas as to how to make 56 million jobs grow after the war, where only 46 million existed before.

Both kinds of people, who hold these different ideas, sincerely want to make the postwar world a better place for you to live in. They have complicated arguments, backed by lots of figures.

But when you trim all the arguments and figures down, you find that one side believes in DIVIDING jobs to make them go round, and the other side believes in MULTIPLYING jobs so there will be greater opportunity for all.

We believe in the MULTIPLYING plan for making postwar jobs and ask you to believe in it too.

Look back over our history. What made us great? Was it rich soil? Africa's is as rich. Was it

[FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18), N. Y.]

# *Have you ever been out of a job?* (cont'd)

natural resources? China has them in abundance.

NO, the greatness and the good living of America is the direct product of her genius for doing more work in less time.

Invention is the source of improvement, and *improvement* is the multiplier of jobs . . . when products are improved in service or style, or lowered in price, new customers are attracted and new jobs created.

That's why it is true that good living has its source in industrial progress.

When industrial progress is interrupted, we have a depression, and there is less good living.

When (through courageous investment in new and better products) industrial progress is resumed, we go on to even higher levels of good living.

► If every able-bodied person in America is to have a job, then we must all understand the things that make good living possible, and we must all help *improve* the methods that have given so much good living to so many people already.

For businessmen, that means a constant search for improved methods and machines, a regular year-after-year investment in industrial progress. This means avoidance of such things as speculation in inventories that tend to create booms and depressions rather than consistent progress.

For every citizen, it means a constant search for the best ways and means to prevent and cure depressions.

Businessmen, alone, cannot prevent bad times. It's a job for *every* citizen. Every American can help just by knowing that good living comes from doing more work in less time. If you, and all other Americans, swing on to that fact, the laws that control our rate of industrial progress will be better designed to keep the improvement engine running.

That's where government really can be helpful in postwar planning.

It can encourage the "take a chance" spirit that is the basis of all progress. And it can improve the measures which prevent and cure depression. At present, our laws are not framed to encourage investment in new and better methods.

Many local, state and national taxes work out in favor of keeping an old machine, instead of buying a new one.

► There are tens of thousands of machines in the country that are over 20 years old. Even our shiny new war equipment is living 3 years in one, and will be old when the war is over.

Every machine should be regarded as obsolete as soon as it is installed and work started on a better one. In the long run, that is the best way to multiply jobs and create better living. Our laws should *encourage* the process, not *discourage* it.

New machines can only be bought with the profits created by old machines. The money that is laid aside by industry to develop and buy new machines is called "Seed Money." If laws take away too much of the Seed Money of business, that will prove disastrous. High taxes must be paid, but they should not destroy Seed Money, which is the only source of improvement.

That's why it's so important for everyone, no matter what his walk in life, to know this fundamental fact:

*"Industrial Progress*
*is the Source of all Good Living."*

**THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION**

24 publications, which gather "war-news" from the "war-production-front" through a staff of more than 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

**McGRAW-HILL BOOKS**

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

*This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.00 per 100; $10.00 per 1000.)*

## McGRAW-HILL

*PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.*

*330 WEST 42ND STREET, NEW YORK (18), N. Y.*

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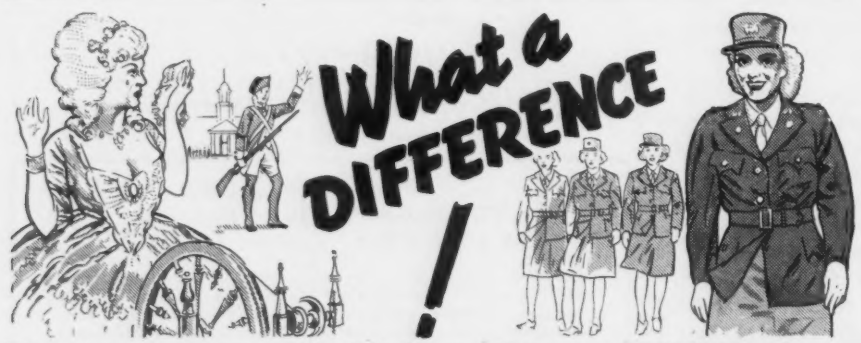


**This gives you some idea of the difference in efficiency and RESULTS—when you use the ultra-modern BRIEGEL METHOD of making thin wall conduit connections instead of many old-fashioned methods still on the market.**

***You conserve critical steel***—Briegel fittings are made with 25% less steel than any other fittings on the market.

***You save time***—just two squeezes with the patented B-M "indenter" (illustrated at left) and a smooth, clean connection is made. No extra turns or twists—no nuts to tighten. Up to 50% saving on precious time!

***You save materials***—fewer items to buy and handle. MORE PROFIT ON EVERY JOB!

The Only Tool You Need
**(Costs just $1.25)**

Approved by Underwriters' Laboratories.
Prompt Deliveries on All Properly Rated Orders!

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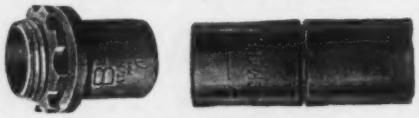
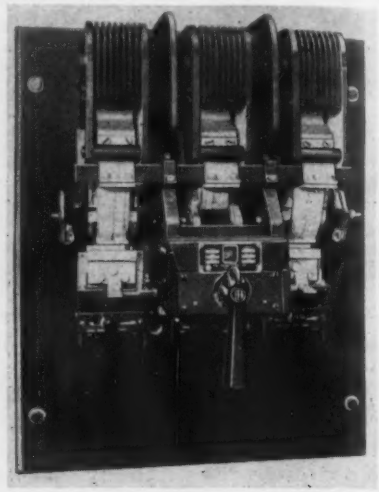


The M. B. Austin Co.
Chicago, Ill.
Clayton Mark & Co.
Evanston, Ill.
Clifton Conduit Co.
Jersey City, N. J.
General Electric Co.
Bridgeport, Conn.
The Steelduct Co.
Youngstown, Ohio
Enameled Metals
Pittsburgh, Pa.
National Enameling & Mfg. Co.
Pittsburgh, Pa.
Triangle Conduit & Cable Co.
New Brunswick, N. J.

**BRIEGEL METHOD TOOL CO., Galva, Ill.**


## Air Circuit Breaker (1203)

I-T-E Circuit Breaker Co. has announced a new trip-free air circuit breaker with interrupting rating of 50,000 rms. amp. Ratings are 600 volts a-c, 250 volts d-c, 100 to 1,600 amp. These units are available for manual or electric operation and in one-, two- and three-pole styles. Mounting may be on open type or dead-front switchboards or in individual steel enclosures of general purpose or weatherproof construction. The illustration is of a manually operated unit.



## Low-Resistance Test Sets (1204)

Shallcross Mfg. Co. has developed low-resistance test sets (Army and Navy range) which it claims have complete portability and greater freedom, ease and speed of operation than previous models. The unit is supported by shoulder straps, leaving hands free. Bond or contact resistance measurements as low as .0001 ohms can be made, it is stated, by attaching the fixed clamp to one side of the bonded surface and touching the hardened points of the pistol grip exploring probe to the other side.

These sets are recommended by the manufacturer for testing aircraft and railroad bonds, radio equipment, contact resistance of relays, circuit breakers, switches. Type 645 (Army range) is 0.005 and 0.5 full scale; Type 653 (Navy range) is 0.003 and 0.3 ohms full scale.

## Braking Relay (1205)

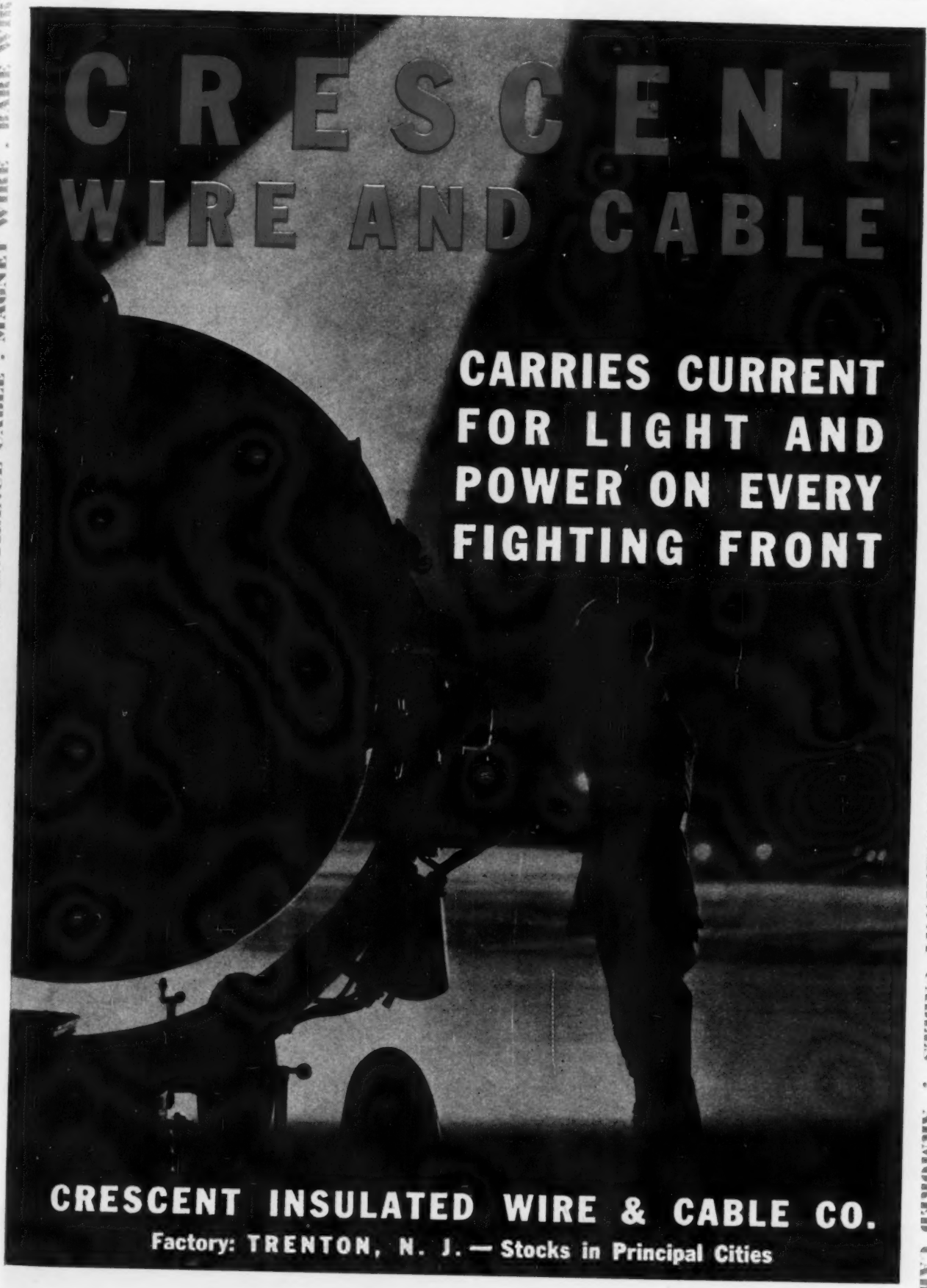
Struthers-Dunn has announced a relay for dynamic braking with split-series field motors, and designed for aircraft and other applications. The manufacturer states that the relay may be used for operation of retractable landing gears, wing flaps, trim tabs, bomb bay doors, hoists and other applications utilizing reversing motors. For winch operations, the relays permit substitution of a simple locking dog for the conventional large magnetic brake, it is claimed.

## Deoxidizing Solution (1206)

Technical Processes Division of Colonial Alloys Co. is offering an alkaline solution for aluminum deoxidizing and cleaning which it calls Deox-Aluminum. This solution is used as a dip at room or elevated temperatures from about 10 seconds to one minute, it is stated. It is supplied as salts and is mixed with water by the user.

VARNISHED CAMBRIC . RUBBER POWER CABLES . BUILDING WIRE . RADIO WIRES . SIGNAL CABLE . FLEXIBLE CORDS . LEAD-ENCASED AND PARKWAY CABLES . ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE . SERVICE ENTRANCE CABLE . MAGNET WIRE . BARE WIRE




CRESCENT ENDURITE SUPER-AGING INSULATION . WEATHER-PROOF WIRE

# ANOTHER FIRST FOR G-E RESEARCH....

# Watch Dog

REG. U. S. PAT. OFF.

## FLUORESCENT STARTER

- **IT STARTS 'EM HOT AND STOPS 'EM COLD**

**FOR 40-WATT LAMPS... READY NOW**

Shipments of the FS-40 Watch Dog starters can be made immediately to war plants, based on priority ratings. For example, a shipment for a plant with an AA-2x rating can be made promptly from Distributors' stock.

**FOR 100-WATT LAMPS... AVAILABLE DECEMBER 1**

**THE BEST INVESTMENT IN THE WORLD IS IN THIS COUNTRY'S FUTURE—BUY WAR BONDS**

**GENERAL ELECTRIC**

# AMAZING NEW G-E RESEARCH DEVELOPMENT MAKES FLUORESCENT LIGHTING MORE EFFICIENT THAN EVER

HERE are General Electric's latest achievements to make fluorescent lighting more efficient than ever . . . the G-E FS-40 and FS-100 Watch Dog fluorescent lamp starters. These new starters, the result of the combined efforts of the G-E Research Laboratories at Nela Park and Bridgeport, offer several outstanding advantages over standard starters:

1 **Prevents flicker** that annoys workers and slows up war production.

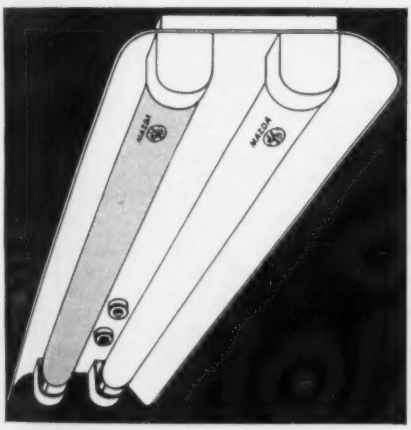
2 **Conserves electricity** by preventing burned-out lamps from being started needlessly.

3 **Increases life of fluorescent auxiliaries.** The average life of the FS-40 Watch Dog is equivalent to the life of ten 40-watt fluorescent lamps compared to two or three with standard starters (Under specified test conditions the FS-40 outlasted an average of ten fluorescent lamps.) Ballast life is also lengthened.

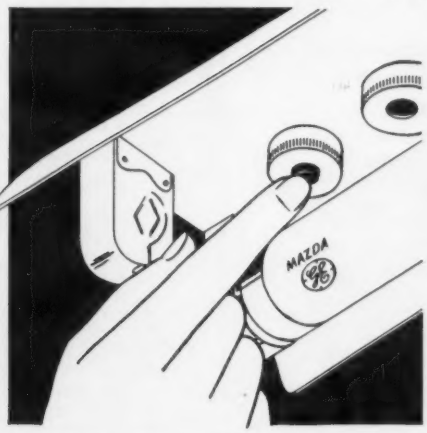
* * *

Distribution and sales of the Watch Dog starters are handled through the Appliance and Merchandise Department. For new Fluorescent Accessories Catalog write to Section GN-1136-F, General Electric Company, Bridgeport, Connecticut.

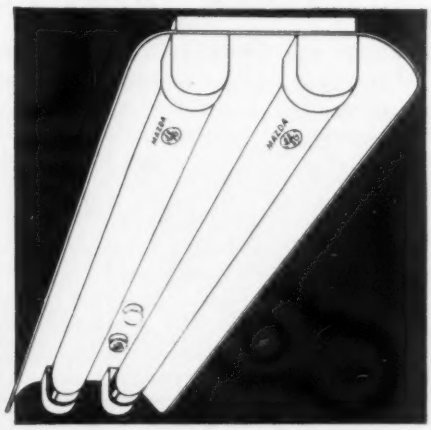
## HERE'S HOW NEW "WATCH DOG" STARTERS WORK!



1 When the lamp dies, the G-E Watch Dog cuts out. No flow of current trying to restart dead lamp means no flickering. Current is saved, ballast safeguarded, and starter life prolonged.




2 No "cooling" period is required to reset the starter when replacing a dead lamp. Starter remains in fixture and is reset by pressing button before new lamp is put in.



3 As soon as the new lamp is inserted, the G-E Watch Dog Starter brings it into the circuit immediately, resuming normal lamp operation.

*General Electric Lamp Research is responsible for much of the good lighting that is speeding war production today. The never ending goal of that great research organization is to make General Electric lamps stay brighter longer.*

MADE TO STAY BRIGHTER LONGER

*Hear the General Electric radio programs: "The G-E All-Girl Orchestra," Sunday, 10 p.m. EWT, NBC; "The World Today" news, every weekday, 6:45 p.m. EWT, CBS.*

G-E MAZDA LAMPS

# BLAW-KNOX *Electroforged* GRATING

**SAFE: twisted bar does the trick  STRONG: one piece electroforged  CLEAN: no sharp angles to clog**

**EASY TO PAINT · OPEN FOR LIGHT AND AIR**

## Whatever your grating needs—here's how to select the proper size.

### WHAT TO SPECIFY WHEN ORDERING BLAW-KNOX ELECTROFORGED GRATING

- ★ Size of bars and type.
- ★ Painted or galvanized.
- ★ Dimensions of area to be covered.
- ★ Direction bearing bars are to run.
- ★ Is clearance to be allowed.

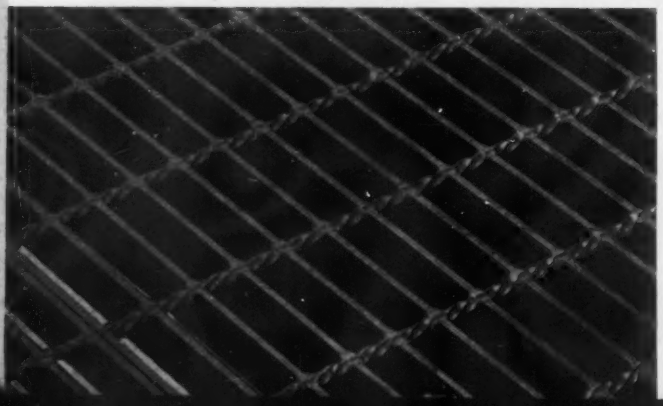
### BLAW-KNOX ELECTROFORGED STAIR TREADS

These treads are designed for the development of unusual strength against impact. Standard sizes and specifications follow:

| Abrasive | Diamond Plate | TYPE "J" — 1" x ⅛" BARS | | |
|---|---|---|---|---|
| Width | Width | Min. Length | Suggested Max. Length | A |
| 6¾" | 6⅛" | 1'6" | 3'0" | 2½" |
| 7⅛" | 7¼" | 1'6" | 3'0" | 4½" |
| 9⅛" | 8⅛" | 1'6" | 3'6" | 4½" |
| 10⅛" | 9⅛" | 1'6" | 3'6" | 7" |
| 11½" | 10⅛" | 1'6" | 3'6" | 7" |

| Abrasive | Diamond Plate | TYPE "L" — 1¼" x ⅛" BARS | | |
|---|---|---|---|---|
| Width | Width | Min. Length | Suggested Max. Length | A |
| 7⅛" | 7¼" | 2'0" | 4'0" | 4½" |
| 9⅛" | 8⅛" | 2'0" | 4'0" | 4½" |
| 10⅛" | 9⅛" | 2'0" | 4'0" | 7" |
| 11½" | 10⅛" | 2'0" | 4'6" | 7" |
| 12⅛" | 12" | 2'0" | 4'6" | 7" |

**BLAW-KNOX DIVISION**
**OF BLAW-KNOX CO.**
2072 FARMERS BANK BUILDING  PITTSBURGH, PA.



### TABLE OF SAFE LOADS BLAW-KNOX ELECTROFORGED GRATING

SIZE OF BEARING BARS 1 IN. APART

| Span, ft.-in. | | 2-0 | 2-6 | 3-0 | 3-6 | 4-0 | 4-6 | 5-0 | 5-6 | 6-0 | 6-6 | 7-0 | 8-0 | 9-0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ¾x⅛ | U | 330 | 222 | 143 | | | | | | | | | | |
| | D | .085 | .134 | .192 | | | | | | | | | | |
| | C | 330 | 265 | 215 | | | | | | | | | | |
| | D | .068 | .108 | .154 | | | | | | | | | | |
| ¾x⅜ | U | 500 | 320 | 217 | | | | | | | | | | |
| | D | .085 | .134 | .192 | | | | | | | | | | |
| | C | 500 | 400 | 325 | | | | | | | | | | |
| | D | .068 | .108 | .154 | | | | | | | | | | |
| 1x⅛ | U | 600 | 384 | 267 | 188 | 150 | | | | | | | | |
| | D | .064 | .099 | .143 | .195 | .256 | | | | | | | | |
| | C | 600 | 480 | 400 | 330 | 300 | | | | | | | | |
| | D | .051 | .080 | .115 | .156 | .205 | | | | | | | | |
| 1x¼ | U | 900 | 580 | 400 | 286 | 225 | | | | | | | | |
| | D | .064 | .099 | .143 | .195 | .256 | | | | | | | | |
| | C | 900 | 725 | 600 | 500 | 450 | | | | | | | | |
| | D | .051 | .080 | .115 | .156 | .205 | | | | | | | | |
| 1¼x⅛ | U | 950 | 600 | 420 | 303 | 232 | 184 | 146 | 120 | | | | | |
| | D | .051 | .081 | .115 | .157 | .205 | .259 | .321 | .389 | | | | | |
| 1¼x⅜ | C | 950 | 750 | 630 | 530 | 465 | 415 | 365 | 330 | | | | | |
| | D | .041 | .064 | .092 | .125 | .163 | .207 | .256 | .310 | | | | | |
| 1¼x½ | U | 1425 | 900 | 633 | 457 | 350 | 278 | 220 | 182 | | | | | |
| | D | .051 | .081 | .115 | .157 | .205 | .259 | .321 | .389 | | | | | |
| 1¼x⅝ | C | 1425 | 1125 | 950 | 800 | 700 | 625 | 550 | 500 | | | | | |
| | D | .041 | .064 | .092 | .125 | .163 | .207 | .256 | .310 | | | | | |
| 1½x⅛ | U | 1365 | 880 | 610 | 445 | 340 | 266 | 220 | 182 | 150 | 128 | 110 | | |
| | D | .043 | .067 | .094 | .131 | .166 | .216 | .267 | .324 | .385 | .440 | .522 | | |
| 1½x⅜ | C | 1365 | 1100 | 915 | 785 | 680 | 600 | 550 | 500 | 450 | 415 | 385 | | |
| | D | .034 | .053 | .077 | .104 | .137 | .173 | .214 | .259 | .308 | .361 | .418 | | |
| 1½x½ | U | 2050 | 1320 | 917 | 672 | 512 | 400 | 330 | 273 | 225 | 192 | 164 | | |
| | D | .043 | .067 | .094 | .131 | .166 | .216 | .267 | .324 | .385 | .440 | .522 | | |
| 1½x⅝ | C | 2050 | 1650 | 1375 | 1175 | 1025 | 900 | 825 | 750 | 675 | 625 | 575 | | |
| | D | .034 | .053 | .077 | .104 | .137 | .173 | .214 | .259 | .308 | .361 | .418 | | |
| 1¾x⅜ | U | 2800 | 1780 | 1230 | 915 | 700 | 544 | 440 | 364 | 308 | 262 | 228 | 175 | 133 |
| | D | .038 | .057 | .082 | .112 | .147 | .185 | .229 | .276 | .330 | .387 | .450 | .580 | .737 |
| 1¾x⅝ | C | 2800 | 2225 | 1860 | 1600 | 1400 | 1225 | 1100 | 1000 | 925 | 850 | 800 | 700 | 600 |
| | D | .029 | .046 | .066 | .090 | .117 | .148 | .183 | .221 | .264 | .308 | .358 | .468 | .593 |
| 2x⅜ | U | 3650 | 2340 | 1618 | 1200 | 912 | 723 | 580 | 482 | 400 | 346 | 293 | 225 | 175 |
| | D | .032 | .050 | .072 | .099 | .128 | .163 | .201 | .243 | .289 | .341 | .397 | .516 | .651 |
| 2x⅝ | C | 3650 | 2925 | 2425 | 2100 | 1825 | 1625 | 1450 | 1325 | 1200 | 1125 | 1025 | 900 | 800 |
| | D | .026 | .040 | .057 | .078 | .102 | .129 | .160 | .193 | .230 | .269 | .314 | .409 | .518 |
| 2¼x⅜ | U | 4650 | 2960 | 2065 | 1515 | 1150 | 912 | 740 | 608 | 516 | 438 | 379 | 288 | 228 |
| | D | .027 | .044 | .064 | .087 | .113 | .148 | .177 | .214 | .255 | .305 | .349 | .455 | .576 |
| 2¼x⅝ | C | 4650 | 3700 | 3100 | 2650 | 2300 | 2050 | 1850 | 1675 | 1550 | 1425 | 1325 | 1150 | 1025 |
| | D | .023 | .035 | .051 | .070 | .091 | .115 | .142 | .172 | .204 | .240 | .279 | .364 | .466 |

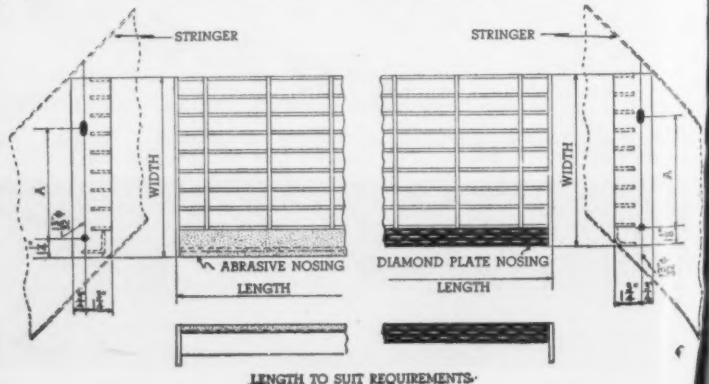
C — Safe concentrated load in pounds per foot of width

U — Safe uniform load in pounds per foot of width

D — Deflection in inches

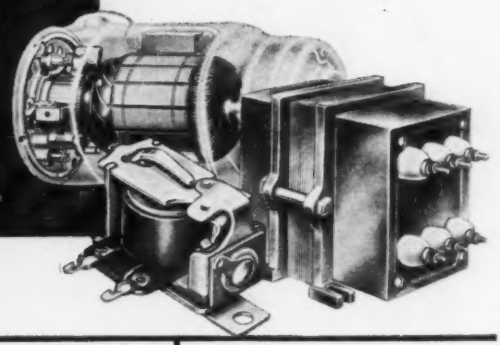
Spans to right of heavy line not recommended

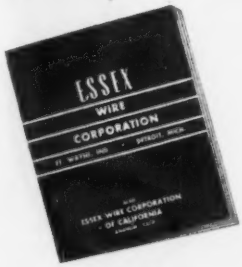
Maximum allowable fiber stress 16,000 lbs. per sq. in.



# INFORMATION

## ON ELECTRICAL AND MECHANICAL MATERIALS AVAILABLE AT TRI-STATE



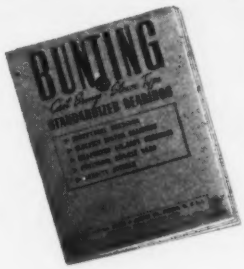



Aircraft Wire
Motor & Transformer Lead Wire
Magnet Wire
Portable Power Cables & Cords

ESSEX WIRE CORPORATION
FT. WAYNE, IND. & DETROIT, MICH.
AND ESSEX WIRE CORPORATION OF CALIFORNIA • ANAHEIM, CALIF.

Electric Motor & Generator Brushes
Carbon Plates, Rods & Specialties
Radio Suppressors & Resistors

OHIO CARBON COMPANY
CLEVELAND, OHIO




Electric Motor & Generator Bearings
Bronze Solid & Cored Bars
Anti-Friction Babbit & Bearing Metal

BUNTING BRASS & BRONZE
TOLEDO, OHIO

Phenolic Sheet, Rod, Tube
Vulcanized Sheet Rod & Tube
Sheet Insulation, Fabricated Specialties

TAYLOR FIBRE COMPANY
NORRISTOWN, PENNSYLVANIA

Motor, Generator & Armature
Insulating Varnish
Electronic Protective Sealers
Machinery Enamels
Spirit Finishes & Thinners

P. D. GEORGE COMPANY
ST. LOUIS, MISSOURI

Vartex Varnish Cambric Cloth & Tapes
Copaco Insulation, Combinations, Twine, Cotton Tape, Mica, Varnish Tubings

TRI-STATE SUPPLY CORPORATION
LOS ANGELES, CALIFORNIA

Commercial, Automotive, Tool & Generator, Commutators, Commutator Saws & Mica Cutters

HOMER COMMUTATOR CORPORATION
CLEVELAND, OHIO

Hot-Dip Galvanized, Electro-Galvanized, Enameled Conduit and Electrical Metallic Tubing and Fittings

THE STEELDUCT COMPANY
YOUNGSTOWN, OHIO

**COMPLETE TECHNICAL INFORMATION, SPECIFICATIONS ENGINEERING DATA, CHARTS AND TABLES**

## NOW AT 3 KEY LOCATIONS

# TRI-STATE SUPPLY CORPORATIONS

| LOS ANGELES | SAN FRANCISCO | SEATTLE, WASH. |
|---|---|---|
| 544 S. San Pedro St. | 554 Bryant St. | 318 Occidental Ave. |
| MUtual 2354 | EXbrook 8890 | MA 7146 |

# FLAMENOL*
## BUILDING WIRE
(Type SN—Small Diameter)

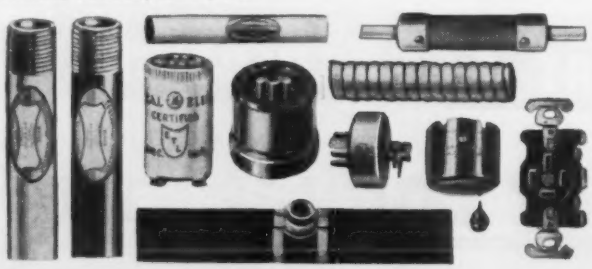
## For All Wiring Purposes

HERE'S a wire you'll like to use. It's easy to install and can be depended upon to give long, satisfactory service. Flamenol small diameter building wire is a time-tried product. It was developed before the war and has proved its worth in installations in all sorts of buildings. Its thermo-plastic insulation is superaging, high in dielectric and mechanical strength, flame retarding and resistant to oils, moisture, acids, etc.

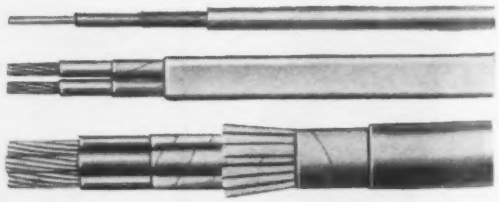
Flamenol building wire is ideal for maintenance wiring, re-wiring or new wiring. It can be used for branch circuits, feeders or special wiring. It is available in sizes 14 to 1,000,000 CM. (Resins are permitted for electrical conductor insulation where copper is allocated.)

### G-E CONDUITS AND WIRING DEVICES

General Electric also offers five conduits and a full line of wiring devices including: White and Black rigid conduits, EMT, flexible metal conduit, Fiberduct; and switches, lampholders, outlets, fuses, etc.



### G-E LEADED CABLES, TYPE RL



G-E single- and multi-conductor lead sheathed wires and cables are available in sizes 14 to 2,000,000 CM. These sturdy wires and cables are insulated in accordance with WPB limitations and are sheathed with commercially pure lead formed tightly around the core. Special precautions are taken to control the thickness of the lead and to center the cable in the sheath.

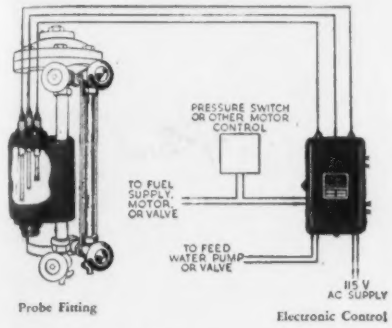
**FOR FURTHER INFORMATION** on Flamenol Building Wire, G-E lead-sheathed wires and cables, conduits or wiring devices see your G-E Merchandise Distributor or write to Section CDW1233-18, Appliance and Merchandise Dept., General Electric Co., Bridgeport 2, Conn.

** Reg. U.S. Pat. Off.*

GENERAL ELECTRIC

### Feedwater Controls (1207)

Combustion Control Corp. has a line of electronic feedwater controls for automatically maintaining constant boilerwater levels and guarding against low-water hazards. For pump control and low-water protection, the unit is used with a probe fitting which may be mounted parallel to the water column or directly on the boiler and is wired to the electronic control. Types are available for pump control only or for low-level protection only.


PRESSURE SWITCH OR OTHER MOTOR CONTROL
TO FUEL SUPPLY MOTOR OR VALVE
TO FEED WATER PUMP OR VALVE
115 V AC SUPPLY
Probe Fitting
Electronic Control

Typical FIREYE Installation For Automatic Boiler Feedwater Control And Low-Level Safeguard

These controls are supplied as standard for boiler pressures to 300 lb. and for operation on 115 or 230 volts a-c, 60 cycles. The probe housing is furnished either in cast or malleable iron and the electronic control is a weatherproof pressed steel housing, both finished in green crystal. Equipment governs solenoid valves, small horsepower pump motors or pump motor magnetic starters.

### Tracer Wire Coating (1208)

Sterling Varnish Co. has a group of colored identification coatings for tracer wire applications. This S-184 Identifier may be applied by running the wire through the varnish or by dipping the entire coil of wire in it. According to the manufacturer, the finish is smooth and fast drying qualities permit handling in less than one minute after application.

### Checking Device (1209)

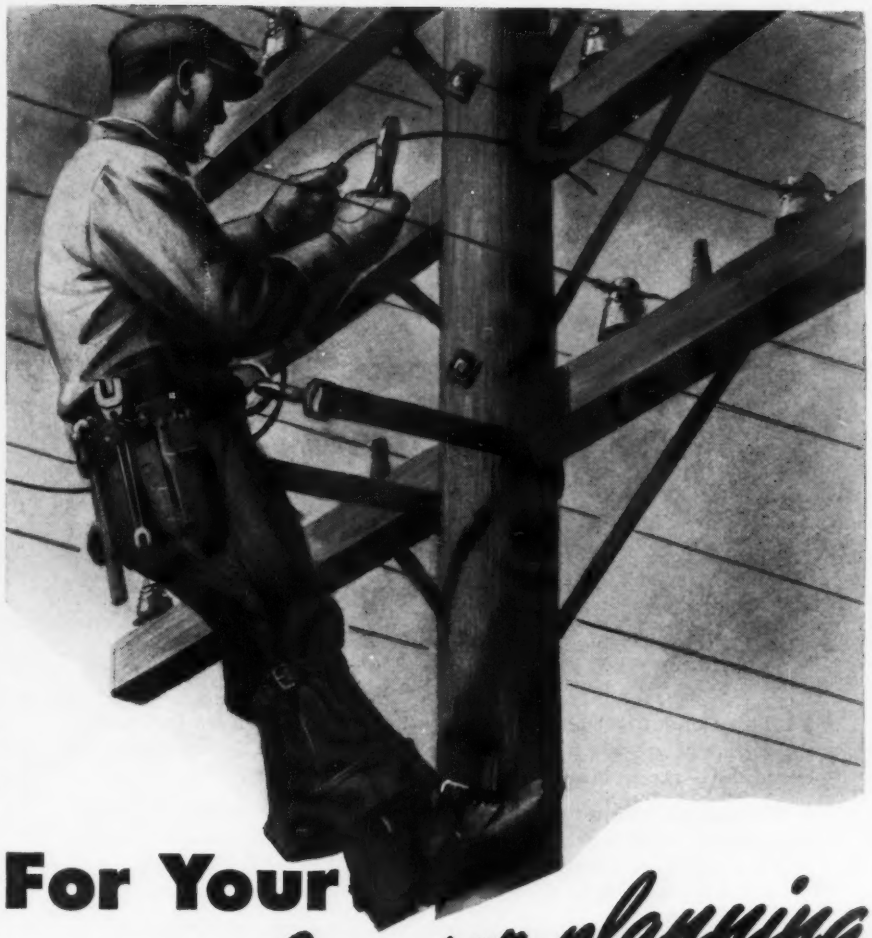
Dumont Laboratories announce an electronic device for metallurgical checking and automatic sorting. It is claimed by the manufacturer that, in addition to grading and sorting, this instrument will detect the presence of any metal in non-magnetic material, with a sensitivity depending upon the mass of the particles to be detected.

### Pipe Gage (1210)

Three-Point Gage Co. is offering a pocket-size pipe gage for all sizes from ⅛ to 12 in. It consists of two pivoted steel plates with edges curved at three points for contact with the pipe, and a scale which automatically registers the pipe size in terms of inside diameter and the drill size for tapping.

### Variable Condensers (1211)

Barker & Williamson is offering a line of heavy-duty variable air condensers for electronic heating applications. Available in almost any required capacity for applications up to 5 kw., 12,500 volts.



For Your Post war planning ... KLEIN'S

This booklet on the care of tools is a Klein contribution to making tools last longer—give better service. Write for a copy.

Victories on many fronts point to the day when power and communication companies will be faced with the peacetime problem of extension and re-habilitation.

Today many utility companies are planning for the future and these plans of necessity call for high quality tools and equipment, for linemen and electricians.

Mathias Klein & Sons are busy making the tools and equipment they have always made. When the war is won, this capacity will be available to produce tools and equipment of the same high quality that has characterized the name Klein "since 1857."

ASK YOUR SUPPLIER

*Foreign Distributor:* International Standard Electric Corp., New York

*Since 1857*

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

# PEAK-LOADED

## FOR THREE YEARS...

## READY FOR A REST

HERE'S A CABLE on which a city has depended for light and power. Through three years of pre-war preparedness and war production, it has operated—overloaded—without breakdown!

Credit goes to the plant that made this cable and to the maintenance engineers who "babied" it through this critical time. And let's think, too, of the jobs that will be created when Victory brings the signal to replace such cables and wires all over the nation. Peacetime jobs—in your company and ours.

JOHN A. ROEBLING'S SONS COMPANY OF CALIFORNIA

SAN FRANCISCO · LOS ANGELES · SEATTLE · PORTLAND

JR ROEBLING

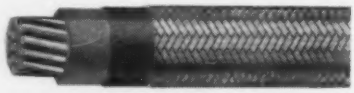
# ROEBLING

*PACEMAKER IN WIRE PRODUCTS*

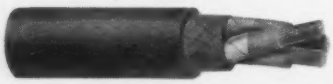
Wire Rope, Strand, Fittings Division
Aircord Division
Suspension Bridge and Cableways Division
Electrical Wire Division
Round, Flat Wire Division
Woven Wire Fabric Division

**WIRES AND CABLES FOR POWER TRANSMISSION AND DISTRIBUTION**

Bare Concentric Copper Strands



Rubber-Insulated Power Cable, Braided and Leaded



Roesheath, Non-Metallic Parkway Cable

Roebling Weatherproof Wire and Cable

Roebling Varnished Cambric Insulated Cable

Roebling Tree Wire

Roebling Zinc-Coated Steel Strand


## Oil Testing Set (1212)

An improved 30,000-volt portable test set for insulating liquids has been announced by General Electric Co. For indoor service, the set provides variable test voltage from 0 to 30,000 volts on single-phase, 115- or 230-volt, 25- or 60-cycle circuits.

Combined in a single unit are a step-up transformer, a potentiometer which gradually raises the test voltage, a voltmeter to measure breakdown values, an automatic circuit breaker and an oil testing receptacle.

## Circuit Breakers (1213)

I-T-E Circuit Breaker Co. announces Type LG air circuit breakers for either manual or electric operation. These units are available in ratings from 2,000 to 10,000 amp. with interrupting ratings of 75,000 and 100,000 amp. Standard voltage ratings are 600 volts a-c and 250 volts d-c.

Enclosures, which can be supplied for indoor or outdoor service, are of heavy-gage, bonderized sheet steel. Full protection is provided for the circuit breaker, which may be opened or closed without opening the enclosure. Connecting cables may enter the enclosure at top, bottom or sides.

## Road Cleaning Magnet (1214)

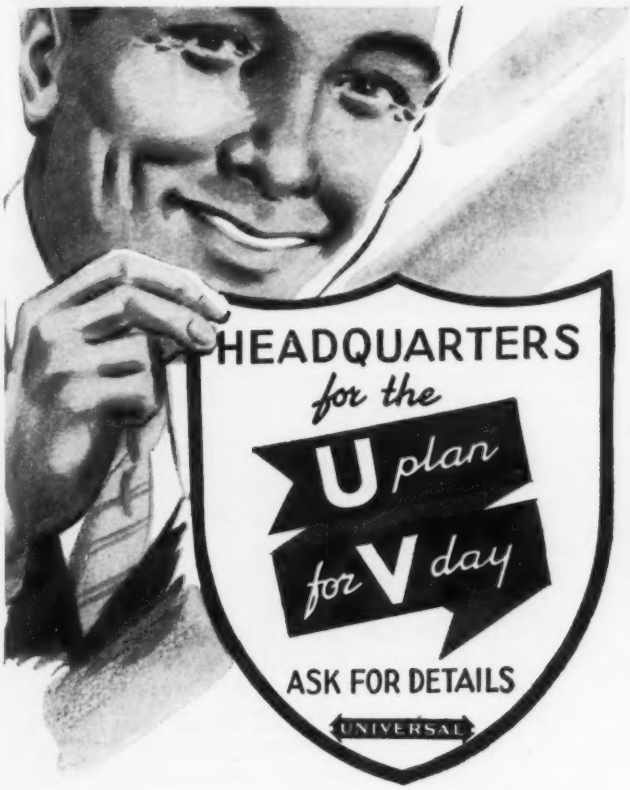
To pick up nails, wire, tacks and other matter which might shorten tire life, Cutler-Hammer has designed a road cleaning magnet. When mounted on a truck, three magnets can cover a road span of 8 to 9 ft., it is stated.

## Counter Assembly (1215)

Barker & Williamson is manufacturing a cyclometer type counter assembly which it claims was designed for registering rotary coil turns but is adaptable to other applications. The counter records down to tenths of a turn, it is stated.

## Combination Panels (1216)

Combination power and lighting panels have been designed by Square D Co. for marine use. They are made to meet either low or high shock specifications of the Navy.




# DON'T MISS *this* OPPORTUNITY!

## Become a "U" Plan for "V" Day Dealer Today!

Profit from the terrific impact of 40 million full page color messages in 14 national magazines which will invite customers to your store for post-war planning in 1944. Universal is glad to contribute the "U" Plan for use by all appliance and housewares dealers. You invest no money—you simply write to Universal for the free Plan Book and then ask for the package of point-of-sale materials including decals, blow-ups of national advertising, consumer folders, War Bond envelopes and priority certificates.

### The "U" Plan Helps You Immediately!

1. By developing store traffic for the immediate sale of available merchandise.
2. By bringing you into contact with prospects for immediate appliance servicing.
3. By renewing friendly relations with old customers and by introducing you to that big 3 million market of newly-weds.
4. By identifying you with a nation-wide effort to step up the sale of War Bonds.

### It Helps You in the Post-War Period!

1. By providing a flexible, fair and orderly method of handling a large volume of business.
2. By creating a backlog of potential orders identified as to customers' names and addresses.
3. By lower selling costs.
4. By directing customers into your store without the expense of field calls or other promotion.
5. By indicating the type and price range of items likely to be demanded by your customers thus guiding your purchases more accurately.

*Establish your store now as appliance and housewares headquarters for greater present and post-war sales. For complete information, write to your nearest Universal distributor or to Dept. EW, Landers, Frary & Clark, New Britain, Conn.*

**UNIVERSAL**

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**LANDERS, FRARY & CLARK ☆ New Britain, Conn.**

# Off-the-record

## BULK OF WAR-BORN DEVELOPMENTS IN ALLIS-CHALMERS MOST CRUCIAL APPLICATIONS TODAY . . . BUT, AS IDEAS

☛ Chances are power gas turbines are going to revolutionize power plants of the future . . . but they won't start doing it till after the war.

They're being built at Allis-Chalmers, yes . . . but only for such super-top priority uses as high octane gasoline cracking plants. Here they supply low pressure air to catalyst towers . . . operate on returned hot process gases otherwise wasted!

We can't tell you how many we've built—or are building today—but the total may be greater than for the rest of the world combined.

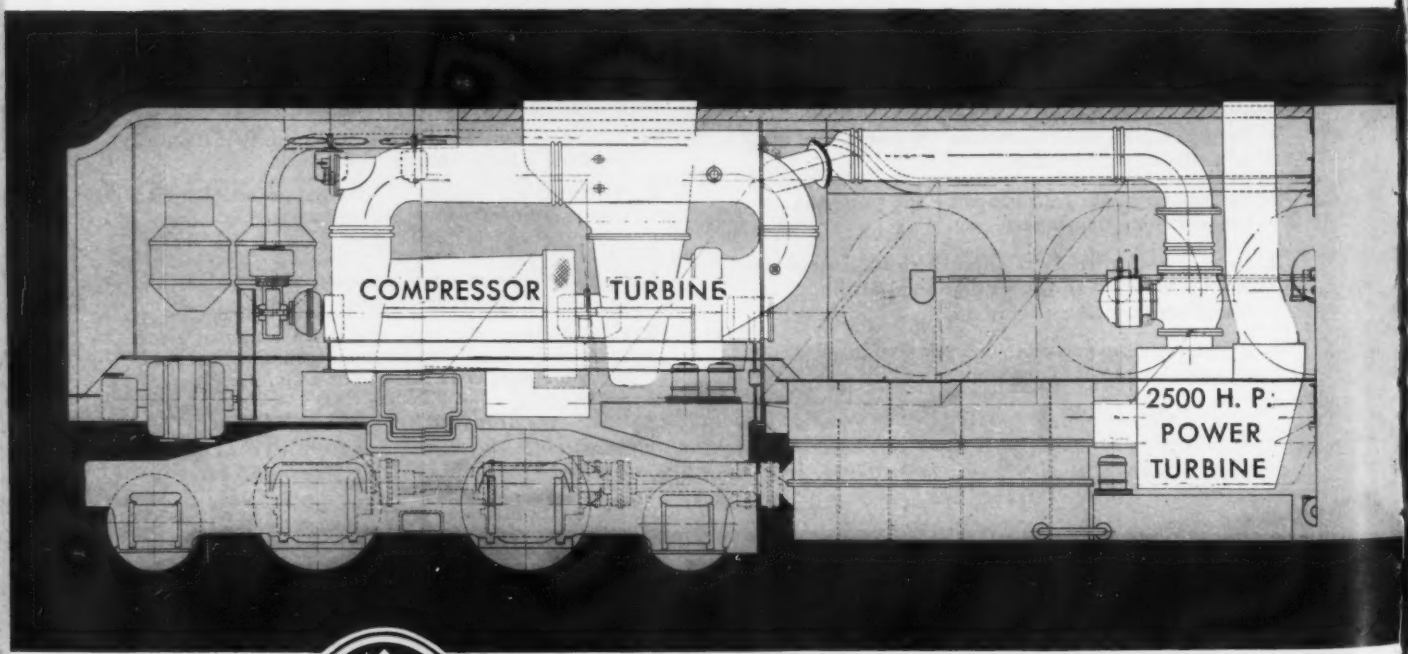
And during this time when turbine-building facilities are choked up with gas turbines, marine turbines and essential power system turbo-generator units, Allis-Chalmers research engineers are setting the manufacturing stage to make power gas turbines a postwar reality.

High-speed, rotating prime movers driven directly from combustion gases will come . . . in compact, low operating cost power gas turbines!

So the picture is this: don't even think about sending in an order for a power gas turbine today. We're snowed under with present turbine commitments. BUT . . . don't forget gas turbines for a minute in your post-war planning. As a stimulator, note below how well the compactness, efficiency and simplicity potentialities of a gas turbine fit with locomotive requirements.

☛ Billions of d-c kilowatt-hours per year . . . are streaming to wartime aluminum, magnesium and chlorine electrolytic cells from thousands of single anode mercury arc rectifier tanks.

PROPOSED 5,000 HP, 120 MILE PER HOUR PASSENGER LOCOMOTIVE (OF THE FUTURE) DRIVEN

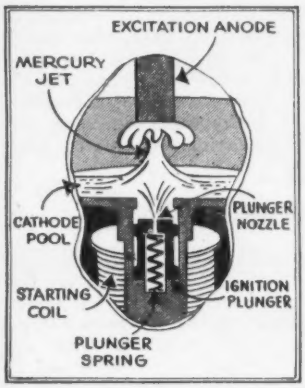



AC ALLIS-CHALMERS MILWAUKEE
WE WORK FOR VICTORY
WE PLAN FOR PEACE
ALLIS

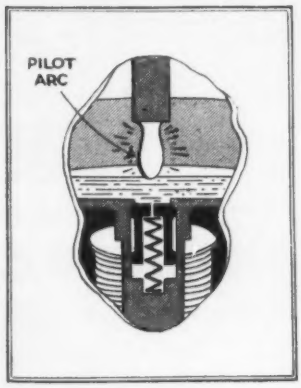
# ideas for 194X

## POWER AND ELECTRICAL EQUIPMENT MUST GO ONLY INTO

## THEY BELONG IN BACK OF EVERY POSTWAR PLANNER'S HEAD




1—IGNITION




2—EXCITATION

Not all these rectifiers are alike. Allis-Chalmers "Excitrons" are continuously excited . . . have added simplicity and reliability.

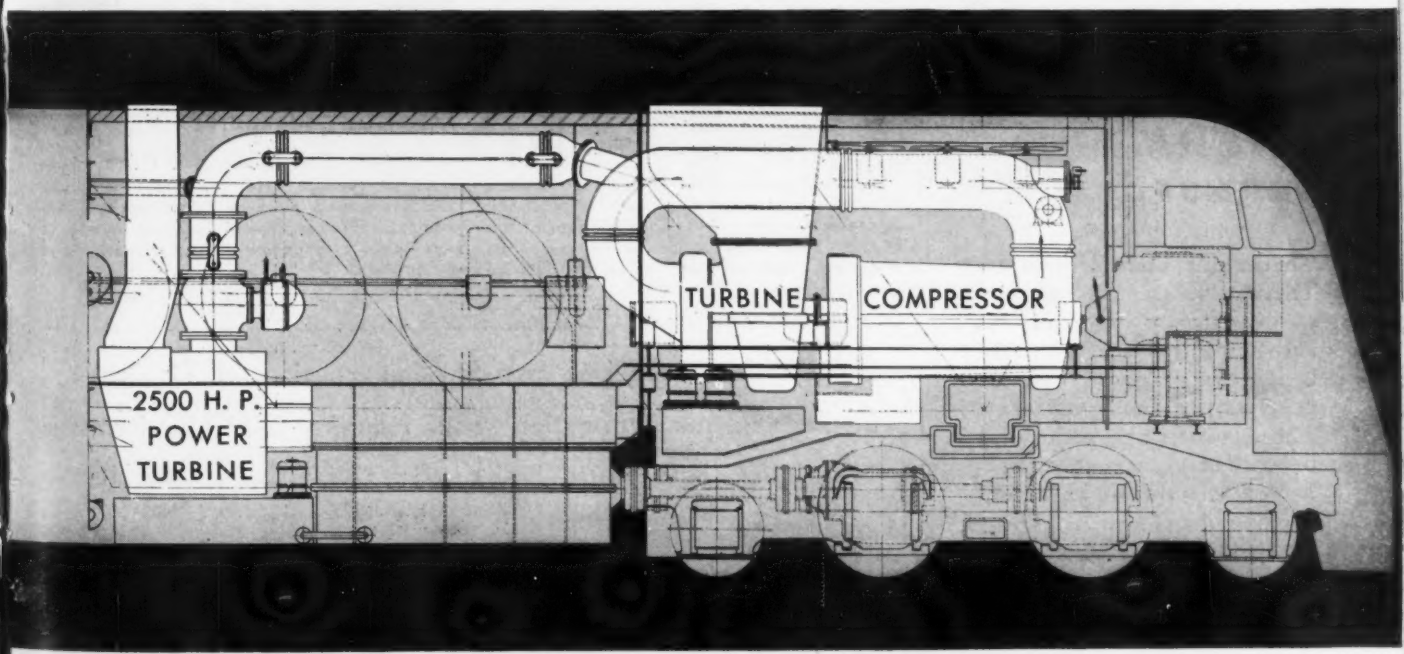
Here's the simplicity: when an Excitron goes on the line, in each tank—1) A solenoid-operated spray device squirts mercury to the excitation anode . . . collapsing jet starts pilot arc; 2) Pilot arc then maintains a cathode spot during Excitron operation, emitting electrons to prime main arcs for "firing when ready."

Here's the reliability: excitation d-c is backed by 3-phase a-c from the line; single phase disturbances can not affect excitation stability. Ignition and excitation involve simple d-c circuits; no unfamiliar electrical auxiliaries to cause trouble. Write for "Questions and Answers on Excitron Continuous Excitation," Leaflet B-6301.

Look for other important new developments in electrical and power equipment from Allis-Chalmers. Maybe we can help you — maybe you can help us. ALLIS-CHALMERS, MILWAUKEE, WIS.

A-1671

BY GAS TURBINES. HIGH POWER PER UNIT OF SPACE. 10 HOUR RUNS WITHOUT REFUELING



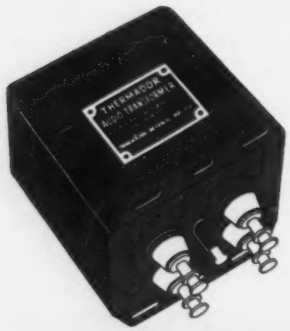

# -CHALMERS

Defeats

HEAT

COLD

HUMIDITY



THERMATITE TREATED

THERMADOR TRANSFORMERS

Thermador Transformers are Thermatite treated to withstand extreme temperatures and humidity—arid or moist heat—dry or damp cold do not hamper their efficiency. Thermatite is the name of a process of accurate heat controlled vacuum impregnation developed and improved over a period of ten years.

*Thermador also manufactures built-in Electric Heaters. Electric Ranges, Electric Water Heaters.*

# BULLETINS

*data books, etc.*

## Control Centers (1217)

Trumbull Electric Mfg. Co. has issued a circular covering its line of control centers, motor and switchboard. These units consist of vertical sections containing bus bars, into which are plugged combination control units of magnetic starters and disconnects, sizes 1, 2, 3 and 4 and switch and circuit breaker control units 30 to 600 amp. They are standardized and prefabricated.

## A-c Welders (1218)

Allis-Chalmers Mfg. Co. has issued a folder covering its new Ampac "400" a-c welder. A pictorial section shows the step-by-step construction and internal assembly of a continuously variable heavy-duty a-c welder. Graphs compare idling loss and efficiency of the Ampac "400" with other a-c welders in 300- and 500-amp. sizes and with a typical d-c welder. Performance data at all loads given.

## Check Charts (1219)

Westinghouse has prepared check charts for single-retort and multiple-retort stokers and giving operating and maintenance hints. These charts are heavy cardboard and approximately 16x21 in.

## Chemical Industry (1220)

"Electricity in the Chemical Industry" is the title of a 35-page booklet prepared by General Electric Co. and describing equipment used for generating, transforming and distributing power, handling material and processing in the electro-chemical and thermo-chemical fields. Illustrated.

## Metal Heating (1221)

The electronic method of heating metals is described in an eight-page bulletin published by General Electric Co. Specifications of the 5- and 15-kw, 550-kilocycle electronic heaters are given, and included in the booklet are illustrations of small parts which may be brazed, soldered or surface hardened by electronic heating.

## Story of the Turbine (1222)

General Electric has prepared a 24-page booklet, "Story of the Turbine." This publication tells the development of the steam turbine in the layman's language. Emphasis is on the place the turbine is filling in war production and will fill in peacetime.

## Switchboards (1223)

Duplex switchboards with secondary control and protective equipment are the subject of a recent General Electric bulletin. The unit described is a factory-assembled steel enclosure with control and indicating equipment on one side and recording, regulating and protective equipment on the other.

## Resistance Welding (1224)

In a 46-page booklet entitled, "Fundamentals of Electronic Control for Resistance Welding," General Electric has reprinted articles written by G-E engineers and published in "Electronics" magazine. Titles are: Electronic Welding Control; Seam and Pulsation Welding Controls, Special Welding Controls; Timers for Welding Control; Energy Storage Welding Controls; Servicing Resistance Welding Controls. A pictorial presentation of G-E accessories and electronic controls for resistance welding is included in the pamphlet.

## Mycalex (1225)

Properties, advantages and applications of mycalex are given in a booklet issued by General Electric Co. Mycalex is a material made from mineral ingredients and designed to meet exacting high-frequency insulation requirements. Applications include radio, industrial control and heating equipment.

## Electrical Connectors (1226)

Cannon Electric Development Co. has published a 10-page catalogue supplement giving information on Type AN electrical connectors. This supplement includes layouts of new insert arrangements, tabular matter and other data.

ELECTRICAL WEST, 68 Post St., San Francisco, 4, California

Please send me information about following CIRCLED items:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 |
| 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 |
| 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | | | |

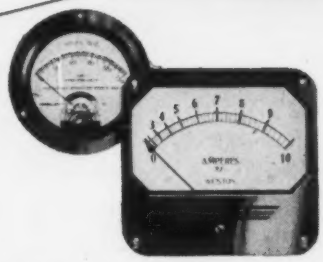
Name..... Company*..... Title*.....

Address.....

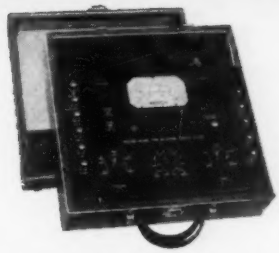
* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

FOR ELECTRONICS MEASUREMENTS, TOO,

# the Standards are Weston

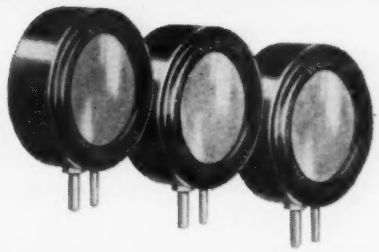


Panel Meters for Electronic applications

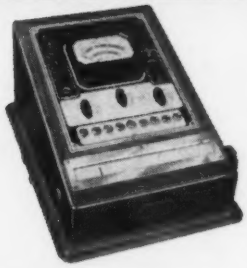


Electronic Circuit Testers

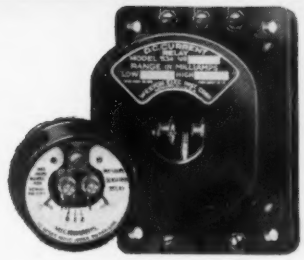
Ultra-Sensitive Laboratory Portables



*Photronic (photo-electric) Cells



Electronic Tube Checkers



Sensitive Relays

In the field of electronics, too, the measurement tools bear the name most familiar to you. For just as WESTON pioneered fundamental electrical measurement, as well as the special measurement needs of radio, so WESTON has provided simple, precise instruments and devices for the problems encountered in electronics research, production and control. Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

*PHOTRONIC — *A registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.*

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

# WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

**FOR OVER 54 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS**

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# for THIS battle, G.H.Q. is at YOUR own desk!

★ Here's how you—yes, YOU—can carry out a smashing "pincer movement" against the Axis. Swing in on one flank with increased production of war goods! Drive in on the other with redoubled purchases of War Bonds through your Pay-Roll Savings Plan!

You're an officer in both of these drives. Your personal leadership is equally vital to both. But have you followed the progress of your Pay-Roll Savings Plan as closely as you have your production?

Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

This advertisement prepared under the auspices of the War Advertising Council and the U. S. Treasury Department.

## LET'S KEEP ON Backing the Attack!

This Space is a Contribution to America's All-Out War Effort by

ELECTRICAL WEST

IT'S THE *PORCELAIN* THAT INSULATE

## PROVING GROUND FOR INSULATORS . .

The temperament of the Lapp organization is that of dissatisfaction with existing methods, existing designs. It is this spirit which produced the Line Post and which made necessary the Lapp laboratory, a corner of which is photographed above. No sanctum sanctorum, this laboratory is truly an engineers' workshop, in continuous day-to-day use, testing, discarding, proving new designs. As we learn how to build better insulators, we build them. Meanwhile, we feel secure in our claim that today's Lapp insulators are adequately suited to today's needs, that you can do no better than to insulate your lines with Lapp. Lapp Insulator Co., Inc., Le Roy, N. Y.

ARMY E NAVY

# Lapp

*Better Porcelain • Better Insulators*

# ELECTRA'S HUSBAND

## *It's Up to the Industry*

"WOMEN, women — phooey!" I muttered as I entered our house the other evening, tired after a long day's work. "Little women, tall, skinny women and short, fat women—they shove and push me around, gossip and giggle in my ear, and then I have to give them my seat on the bus. I'll be glad when this war is over so they can get back to their kitchens where they belong."

These insulting remarks against the members of her sex brought Electra flying from the kitchen sputtering, "They're not any worse than men, and they certainly didn't *ask* you to give them your seat on the bus."

Realizing that this was a touchy subject which never should have been mentioned in the first place, I tried to smooth the matter over by saying, "Now, Electra, you know I admire these women for leaving their homes and working in defense jobs to help speed victory, but survey checks show that they like their new independence and way of life so well that at least 35% of them want to continue after the war. If that is the case, how will we ever provide enough new jobs for the men coming back; who will take care of the home and do the cooking; who will bring our children into the world? Don't you think for one moment that we men are going to back out of the picture and let women earn a living while we keep up the home. No, sir, I refuse to stay home all day cooking, cleaning and taking care of children. I won't have it! How I'd like to see those days again when a woman's place was to keep up a nice home, bear children, cook appetizing meals, and be dependent upon us!"

"Oh, for heaven's sake stop your fuss," sighed Electra. "You wait and see—women will be crazy to leave their jobs and get into their new post-war homes. In these homes housekeeping will no longer be drudgery, and they will have plenty of time for recreation, entertainment, golfing and bridge. What woman wouldn't rather be out on a golf course on nice sunny afternoons than pounding a typewriter in a dreary old office — that is, providing she didn't have to go home and spend hours cooking, cleaning and washing clothes after the game? Come with me, and I'll give you a glimpse into madam's home of tomorrow.

"We're having roast beef for dinner with no points to worry about. It takes us ten minutes to prepare and put it into the pan. Let's open our new induction-heater oven door, slide the roast in and snap on the switch. No, don't move away, wait about six seconds, open the door and remove the roast. This is the miracle of internally induced heat, created electrically by high frequency radio waves, which have their source in the miraculous electronic tube.

"After the guests leave, will we dread the task of doing dishes—certainly not because we'll simply pile the unscraped dishes into a wire basket wheeled up to the table, slip the basket into the machine, press a button and leave the kitchen. The machine will rinse bones, potato skins and other debris from the plates, grind them up and flush them out through the sewer. Scalding water provided by a little heater gadget built into the machine mixes automatically with the soap and the dishes get a good scrubbing. Then they are rinsed and dried by their own heat.

"Look, there's Junior pictured on the wall—wasn't he supposed to be in his crib upstairs? Yes, Junior is upstairs but a silent, wide-awake electric nursemaid watches constantly. Every whimper and action is immediately pictured, movie-like in magic form on the kitchen wall. This is the new inter-room television.

"Now for the living room with its beautiful paint designs on the walls! We never tire of this room because the designs are invisible under ordinary lights but glow brilliantly under ultra-violet illumination."

By this time Electra could see that I was amazed and standing with my mouth open staring at everything she had shown me. You know women, they glory in showing a man anything which stuns or interests him, so she walked over and flicked on the fluorescent light switch, thus turning the paint design on the wall an entirely different color scheme, this one more beautiful than the last.

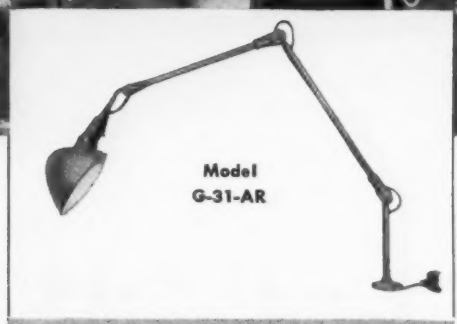
I blinked my eyes and turned away as Electra switched on the radio. When the Kate Smith hour came over the air and her picture was flashed on a screen in front of us, Electra snuggled triumphantly in my chair. Playfully tweaking my ear she continued, "So all this fuss about women not quitting their jobs after the war is crazy. Maybe we used to sit home thinking how glamorous it would be to have a job and be independent. But before the war is over that same glamorous job turns out to be grimy, routine work with us wearily punching a clock each morning. Let the electric industry offer women homes such as this and watch them promptly drop the chains of that wartime job to be free once more."

MANY a time-worn idea from sales techniques obsoleted by the war has turned up in new guise and in strange places. Take the old employee tip system where folks in the manufacturing and office forces turned in the names of friends who were in the market for appliances. In one of the large electric manufacturing companies employees now are being paid for recruiting workers instead of for tips or for actual sales. The rate is $5 for each prospect who is hired, and an additional $2 a month for each month (up to six) which the new employee stays. The plan works, too, and has turned out to be the cheapest form of labor recruiting tried.

Electra said, when I told her about this, that if I ever turned her name in for such a program, she'd expect not only more than $5, but a cut in the money too.

WHAT sort of an animal is a "creative executive"? A letter came in the other day with that new title below the sig. A few years back the word "engineer" seemed to be covered by all sorts of occupations and there appeared "beauty engineers", (now more flossily titled cosmeticians; once just plain beauty shop operators), health engineers (who were nothing but chiropractors) and one cook called himself food engineer.

Are we to have an epidemic of fancy executives now? We have always had hard-boiled executives, now are we to have creative, visionary, and other brands?

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ELECTRICAL WEST

DECEMBER, 1943
VOL. 91, NO. 6

# "They Didn't Believe We Could Do It"

## An interview with Wing Commander Guy P. Gibson, V.C. who led the flight of British bombers which blasted the Mohne, Eder and Sorpe dams in the heart of Germany's industrial Ruhr

*George C. Tenney*
Editor, ELECTRICAL WEST

BREACHING a huge concrete power dam is more than a matter of a little time on a dark night and a bundle of dynamite sticks. Take the word of Wing Commander Guy P. Gibson, who was responsible for the bombing of the Mohne, Eder and Sorpe power dams in Germany, it's a job that requires expert planning, split-second timing, the utmost secrecy and a cool and courageous lot of bomber crews.

Commander Gibson, a handsome wisp of a lad of 25, is the most decorated officer in the British Army with the Victoria Cross, DSO, DFC (twice) and Commander in the Legion of Merit—the latter American decoration held only by Generals Alexander and Montgomery. And he has the further distinction of being rated at the top of Hitler's list of most-wanted United Nations soldiers, with a price on his head. Obviously, he no longer flies over Germany, and hasn't since the eventful night of May 16-17 when millions of tons of water crippled German industrial plants, railroads and cities in the Weser and Ruhr river valleys.

San Francisco Chronicle Photo

Wing Commander Guy P. Gibson, V.C.

"It was in January that I was called into bomber command headquarters and told to recruit a force of veteran bomber pilots for a special mission," Commander Gibson said during a visit to San Francisco last month. "We didn't know what the mission was to be and right up to the night of the raid only seven men in England knew what targets had been selected—the Prime Minister, the commander of the bomber fleets, four scientists and myself. Success of the raid depended in a large measure on maintaining the utmost secrecy. Once training started, we were guarded in everything we did and said. Only once was there a slip. One night a navigator phoned his girl that he couldn't see her because he was off to bomb a dam in Wales. He was called before the entire force the next morning and sacked. It was too bad, because he was a good navigator. But the example served its purpose.

"Naturally the time to bomb a dam is when the reservoir behind it is full. For reasons developed by tests the job had to be done when the water was four feet below the crest of the dam. This condition would hold for just a week. So the time was set for us in advance. But the technique was not. This was determined by work with scale models and by actual tests. Work never stopped all during the time the crews were training. The final sea type mines were not perfected until just four nights before the raid."

Engineering considerations played a large part in the preparations for the raid, Commander Gibson said. For instance, it was determined that an exact speed of 232 mph. was necessary and that the bombers must fly at an elevation of exactly 50 feet above the water surface. If the planes flew higher, the thin-cased sea mines with their extremely heavy charge of explosive burst on impact with the water. If they flew lower, the mines tended to bounce instead of sink. The mines were exploded by hydro-static detonators.

"We flew 150 hours in training for the raid," Commander Gibson recalled. Such intensive training was not new to

him because he had joined the RAF in 1936 for the purpose of learning to be a test pilot. He tested planes for an English manufacturer just one day and was called back into the air force because Mussolini invaded Albania and it seemed an eventual European war was certain. "Because the bombing had to be done at night, special equipment was necessary. All of us wore glasses with yellow lenses, we took big white vitamin pills to sharpen our night vision and we had yellow glass set in the plane windows. Fact is we flew in perpetual moonlight all during the training. It helped, because there was a full moon on the night of the raid.

### Test Raid Helped

"Just a month before the raid we did a special test on an actual dam in England. It was mocked up (camouflaged to look just like the real target. And we blew it all to hell. It helped on the final job because it showed some of the weaknesses of our method. Later we did three dress rehearsals on other English dams but we didn't blow them. They were camouflaged too."

"With all of this training, how did you keep the mission secret?" the Commander was asked.

"It was a bit of a problem," he replied. "We told the crews that the practice was for work against Nazi submarines. We said that naturally the Navy couldn't give us any real subs to practice against. Also that a dam presented the same type of surface to a bomber—rounded and half out of water.

"Before the raid all of the armor plate was taken off the planes to permit heavier petrol loading. We knew the mission would be a long one but we didn't expect it to be as long as it finally turned out."

Although Commander Gibson had flown 174 sorties against the Nazis he indicated that this particular mission brought new emotions into play. Its importance—the dams supplied domestic and industrial water and electric power to vital sections of industrial Germany and regulating water for the whole Ruhr Valley canal system—the risks, the secrecy, gave the crews a greater lift than usual.

"Nineteen planes took off from English bases the night of May 16," he said. "We flew in over the Dutch coast at 20 feet to miss the flak. Even so, three of the planes were hit and had to turn back. The rest of us went on below chimney height and through barrage balloon cables right up to the target. It was then that the full effect of the long training showed. Recognition was positive, even in the moonlight.

"My plane had the first run at the target. It was a delicate job—speed and altitude exact and just a three-yard target area in which to drop the mine. That allowed the bombardier only one-sixteenth of a second in which to press the bomb release button. If the mine was dropped too soon, the underwater explosion would not be effective; if too late, it might hit the dam itself, explode and blow the plane to bits. One did later. The chap on the bombsight had all our lives in his hands.

"As we went down the river valley through blasts of flak, there was a terrific explosion behind the dam and a 2,000-foot geyser of water shot into the air. Right then something happened that we had not planned. The blast set up a tidal wave which swept up the 18-mile long reservoir and lowered the water level at the face of the dam. Thus the second plane couldn't follow in right behind me, but had to wait 15 minutes for conditions to approach normal. The pressure detonators on the mine would not function at the correct depths unless we waited.

### Shortwaved to U. S.

"So the rest of the planes flew in circles over the hills alongside the reservoir while my ship went back and forth close to the dam. All of the time we were talking among ourselves on our radios. Once the raid started we talked steadily. Interesting thing was that our conversation was picked up back home and shortwaved to the United States where your military men could hear all that was happening. The talk went something like this:

" 'Get ready No. 2, the water is about right again.'

" 'Ready, sir.'

" 'Go on in, and good luck!'

" 'No. 3 all set? Watch it closely, No. 2 has been shot down.'

"The Nazis had guns all over the place and when they saw what we were about, they could train everything on us. You see the planes came in at about the same place, at the same altitude and, in addition, we were using searchlights. That made our losses high. You had to admire the courage of the Nazi gunners on the dam. Even when it cracked and it was certain that they were doomed, they stuck it out and kept firing.

"The wait between runs was uncomfortable, but finally we could see a couple of cracks about 300 feet apart on the top of the dam. It seemed to me that the whole dam moved outward. The next mine was squarely on the target and the whole center of the dam just crumbled away. The biggest sheet of water I ever saw shot out into the valley below.

"Then we got out of there."

But the mission wasn't finished. Other dams had been picked out as targets. (Pictures of the blasted dams appeared in July ELECTRICAL WEST.)

"Four planes headed for the Eder Dam on the Weser River and two for the Sorpe Dam on the Fulda. My plane was in the flight that breached the Eder Dam. What happened was much the same as at the Mohne Dam. Only here the deputy commander's bomb timing went wrong. The bombardier dropped the mine just a fraction of a second too late. It hit the dam and plane and all went up in one huge flash of orange flame. This dam was no different than the other. It cracked and then let go with a great flood of water.

"Things were tougher at the Sorpe Dam, and besides our losses had cut down on the number of planes necessary to accomplish that mission. The mines put large cracks in the masonry and reconnaisance later showed the dam to be leaking badly. Good engineering judgment would dictate that the reservoir be drained and the dam be rebuilt. However, the stored water is so valuable that people's lives are in jeopardy because the structure might let go at any moment."

The number of mines necessary to breach a dam is a military secret so Commander Gibson could not tell the number of runs each plane made over the target. The amount of explosive used exceeded 36 tons.

"After the Eder Dam burst, my plane went back to the Mohne to see if it was properly 'pranged'—that's the air slang for wrecked. It was. Later we learned that the break extended clear down to the foundation. Pictures showed that every drop of water was drained. That was a costly blow to the Nazis. Even if it were possible to rebuild the dams, it would require two years to fill the reservoirs.

"We had been over the targets more than 2½ hours—which was longer than we had planned. Our petrol was low so we headed for home. Eight of the original group made it. It was a tough show. The gunners on my plane shot 14,000 rounds of ammunition."

In terms of military strategy, the damage done was worth the losses. Industry was crippled and the lives of thousands of people disrupted. Actual losses are a military secret too, Commander Gibson explained. Dam wardens were to blame for the loss of life.

"Right up until the moment the dams burst, they didn't believe we could do it."

# Electronics at Work In Industry—1

**First of a series of articles dealing with the fundamentals of electronic tubes and circuits and giving commercial applications. History, future applications and the Ignitron are first here discussed**

*E. W. Morris*
Westinghouse Electric & Mfg. Co.
Los Angeles

**Developments in the field of electronics are taking place so rapidly that it is necessary to rely largely on current articles of this type for information. It behooves every electrical man to study up on electronics and keep abreast of developments or some may find themselves replaced by radio students and returning service men trained in this field. ELECTRICAL WEST is pleased to present this series of articles on Electronics at Work In Industry by a man well qualified to discuss the subject.**

ELECTRONICS is a magic word, and stirs the imagination of all. But it should not be mysterious, since now the electron is recognized as the basic principle of the entire electrical industry. Electronics in itself is not new, but what *is* new are the many applications of electronic tubes which now are performing tasks heretofore believed impossible.

Many electrical problems could not be solved at all without electronic tubes. Other functions can be done better by electronics than by mechanical means. Others can be done better mechanically, and it is essential to know when to apply electronics sensibly.

It is the purpose of this series of articles to simplify the understanding of electronics, to emphasize the necessity of applying it only to those problems which can be done more effectively than by mechanical means, and to describe many industrial applications which now are giving satisfactory operation.

Although electronics is as old as the electrical industry, a satisfactory understanding of its basic principles has been reached only within our generation. Electronic tubes, developed since the beginning of the twentieth century originally were applied to radio. Out of the first use of electronic tubes in radio, developed during World War I, have grown many new industries.

Application of electronic tubes to industrial processes has taken place largely during the past 20 years, the real impetus being experienced since 1930. Electronic development again is being accelerated by the necessities of war, and out of it are coming scores of practical, peacetime applications which will provide better living and new enjoyment for all. The release of engineering and manufacturing facilities from the demands of war will provide the means for greater use of electronics in the home, business and industry.

The future of electronics is unlimited in making our living more comfortable. Homes can be made virtually free of dust, smoke and airborne germs. Electronic tubes will destroy bacteria, prevent food spoilage, help process meats and protect the family health. Already familiar applications to the public include opening of doors and automatic control of lights. Electronics will give medicine further tools to protect life and health. Ultra-violet light will be used more extensively for irridation of foods, for disinfection and for prevention of disease.

Principles used in the development of war equipment will be applied extensively in the field of industry to improve products, increase safety, save time and reduce costs. The same device that enables the aviator to "see" obstacles through darkness, clouds and fog can be applied to trains, ships and other vehicles. Processes made possible by electronics in the manufacture of aircraft will be used extensively in the development of lightweight, high-speed

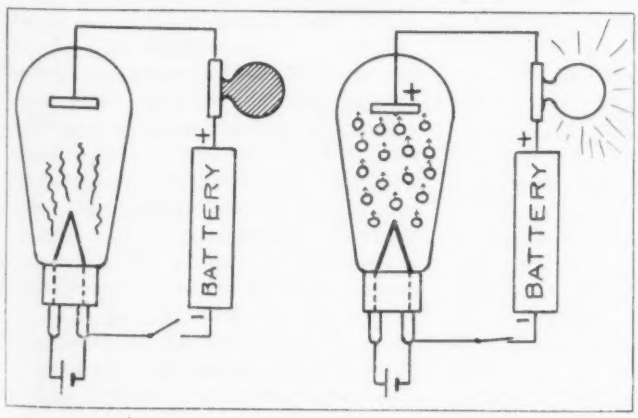
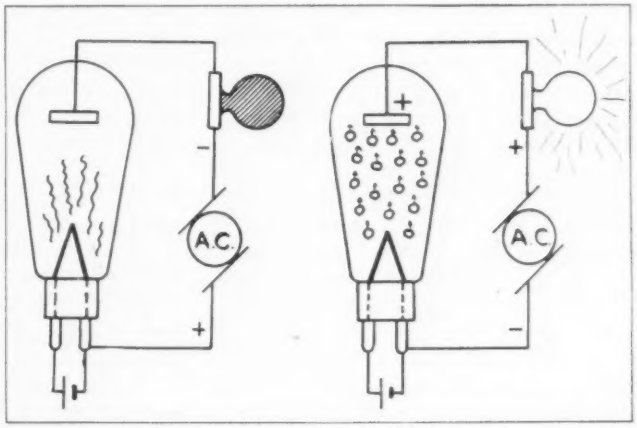



Fig. 1—An electronic tube is essentially a switch. If there is no charge on the anode or plate (left) the electrons driven off by the heated filament or cathode do not reach the anode and there is no circuit through the tube. When, however, the anode is given a positive charge (right) the electrons (Negative particles) are attracted to the positive anode and the electronic switch is closed and a current from the battery lights the lamp

Fig. 2—Electronic tubes rectify. If the battery of Fig. 1 is replaced with a source of a-c potential, then the anode will be alternately negatively and positively charged. When it has a negative charge (left), no current flows as the electrons (negative) are repelled by the negative charge on the anode. During the positive half of the a-c cycle, the anode is positively charged, electrons are attracted and a pulsating d-c current flows



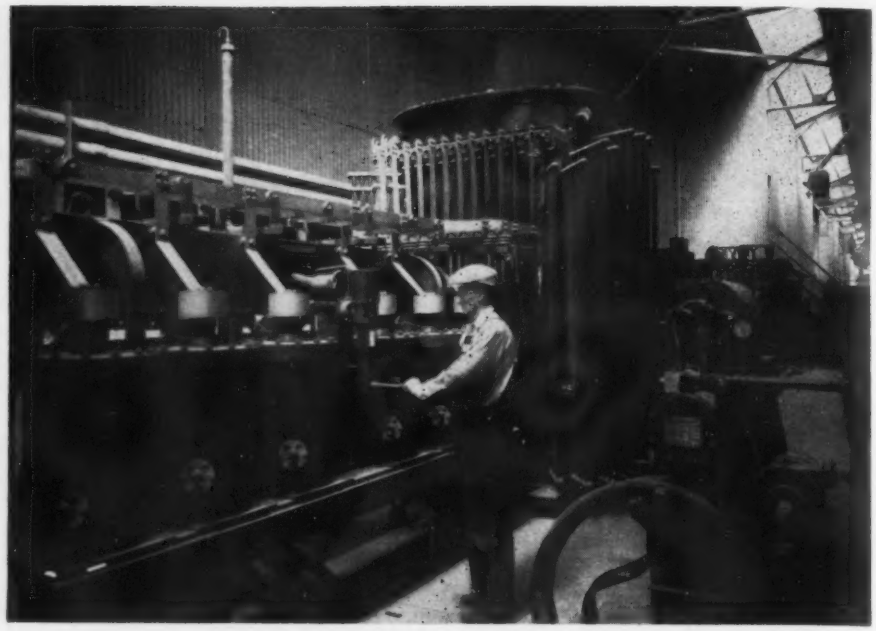
trains. Materials now critical because of shortage will be saved. New processes have been developed for molding plastics and plywood by high-frequency induction heating. Tin is flowed by high-frequency heating and there are many other industrial applications.

In order that we may know how best to apply electronics to our industrial problems, we should know how electronic tubes work, and how they function as part of an electrical circuit. An electronic tube basically is a "switch" for controlling the flow of current. Current is the flow of electrons, those negative particles of electricity which are part of the atoms of every substance found in nature. All atoms are electrically neutral in that they have equal positive and negative charges, although atoms of the various elements have different total charges for each element. The negative particles, or electrons, are alike in all of the 92 different elements, having the same mass, size and electrical charge. Electrons from one element can be substituted for those in another element.

The positive charges, or protons, are not alike in all elements, and also have a much greater individual mass than the electrons. Therein lies the reason why electrons (negative) rather than protons (positive) are used in electronic devices. Since current is the flow of electrons, it requires less force and energy to move an electron than a proton or a positive ion, an atom from which one or more electrons have been removed. A positive ion, having a net positive charge equivalent to the negative charge of an electron after its removal, may have a mass of approximately 1,800 to 400,000 times as great as an electron.

The electronic tube basically provides some means of freeing electrons from atoms and for collecting and controlling them. The electron emitter is called the cathode, and may be a tungsten wire or a nickel wire coated with certain oxides which give off electrons freely when heated, or it may be a pool of mercury. In radio tubes the electron emitter has been called the filament, but is now more properly called the cathode. Electrons may be released by heat, light, intense magnetic field or secondary emission. When electrons are released from the cathode, they are collected at the anode or plate, as it has been called, by attraction of a positive charge, and then passed through an external circuit and made to do work, as shown in Fig. 1.

A tube may be made to rectify by applying alternating voltage between the cathode and the anode. Every time the anode is positive, electrons are attracted and flow through the internal circuit of the tube and the external circuit, but electrons are repelled when the anode is negative and no current flows. Thus the first use of our electronic switch is to *rectify*, passing current in one direction only each half cycle from an alternating voltage applied between the anode and cathode. An illustration of how electronic tubes rectify is shown in Fig. 2.



**D-c for the rod mill at the Pittsburg, Calif., plant of Columbia Steel is supplied by this 1,000-kw., 4,000-amp., 250-volt Ignitron. Assembly includes the transformer, vacuum maintaining and indicating equipment, re-circulating water pump and expansion tank**

Small vacuum tube rectifiers of limited current capacity use heated filaments for electronic emission, but other rectifiers are built with cathodes of different types to permit greater current capacities. These rectifiers use ionization to facilitate utilization of numbers of electrons for large currents. This type of emission is obtained by inserting small amounts of inert gas, such as neon, argon or mercury vapor in the vacuum tube. When positive potentials are applied to the anode, high speed electrons from the cathode strike the inert gas and cause other electrons to be liberated from the gas atoms. Large quantities of free electrons can be obtained in this way, all of which contribute to the current flow required by the load.

The potential drop across a vacuum tube is relatively high, but for a gas filled tube may be as low as 10 or 20 volts. There are many important applications of this basic rectifying principle. Rectifiers, illustrated here, are now in general use supplying direct-current to the electrified transportation industry, to electrochemical plants, and to steel mills, mines and factories. The past few years have witnessed the installation of more than 3,000,000 kw. in capacity of this type of rectifier.

Still other rectifiers may be designed for high output voltages at low current. Electronic rectifiers for 300,000 volts d-c have been built and applied to industrial X-ray and precipitation equipment. In fact, nearly every piece of industrial electronic apparatus includes some form of rectifier to supply d-c potentials to parts of the circuit.

One of the interesting applications of high-voltage rectifiers is in the Precipitron, a device for cleaning air electrostatically. Rectifiers apply 13,000 volts d-c to tungsten wires in the air inlet duct. Incoming air passes through this electrostatic field, where each dirt particle receives a positive charge before it enters the collector chamber. The collector consists of a number of parallel plates, alternately charged positive and negative from a 6,000-volt, d-c source. The dust particles, positively charged, are attracted to and deposited on the negative collector plates. In this way, air is cleaned so thoroughly that dirt particles as small as a quarter-millionth of an inch are removed, protecting instruments and machines from abrasive particles that might damage highly finished surfaces. This application of electronic tubes promises to fill an important part in our postwar world.

The next article on Electronics at Work will describe the operation and applications of the Ignitron.

# Will Wartime Practices Be Retained?

**Two PCEA round-table discussions of Operating Economics Section indicate that economics and good engineering practice will determine extent to which war practices will be retained**

THEME of the discussions was: "How far will we be willing to go in the postwar period in retaining as standard practice the deviations from former specifications, codes, ordinances, company standards, etc., which have been permitted or made necessary under war conditions?" Five questions asked by Moderator Tenney were common to both Los Angeles and San Francisco meetings and these together with the names of the discussers and their comments verbatim or in substance are here given:

*QUESTION: Has present operating experience demonstrated the desirability of continuing the use of transformers with external forced oil cooling as compared with conventional self-cooled or air-pressure types?*

MR. L'Hommedieu—I believe this type of device or transformer has shown itself in its years of service to be an entirely dependable device from an operating standpoint, not only the transformer itself but also the devices which go with it for cooling. I refer to those designed primarily for forced oil cooling. I see no reason why we cannot expect this type of unit to be used in the future.

*Mr. Jollyman*—We have not had enough experience to judge at this time. Increased impedance is distinctly a disadvantage in large transformers in high-voltage networks. It means more power factor correction apparatus. We will have to reserve judgment for some little time.

*Mr. Smith*—In the very large sizes we are going to be able to have larger transformers than heretofore completely assembled. Total cost must be taken into consideration. This is original cost, added to it the capitalized losses and maintenance over the whole life of the transformer. One must have that in mind, as to whether to buy a cheaper transformer which will have higher losses. Obviously a transformer of this sort requires more maintenance. However, the manufacturers have designed the transformers so that the cooling schemes can be taken off, in other words they are sectionalized. If the transformers are large and in an attended station there is a real possibility of their use in the future.

*Mr. Kroneberg*—Operating experience on the Coast has been eminently satisfactory. Former trouble of leaky joints has been successfully eliminated through the use of welding. Improvements may be made in the material used for cooling coils, especially when the location of the transformers is in damp areas, as for example near the ocean. Arrangement of cooling equipment should be on a tank basis and not on a bank basis, since experience has demonstrated that it is difficult to regulate properly the flow of transformer oil in parallel pipes from a central system.

*Mr. Hopkins*—The answer to this question is largely one of economics and the result of experience. In general there is some saving in first cost when compared with transformers of the conventional self-cooled type. There is a decided saving in material which is of primary importance now, but may not be so in the postwar period. Forced oil cooling requires moving parts, such as pumps, blowers, etc., which obviously require maintenance and some periodic attention. This may be a disadvantage, particularly in unattended stations. Forced circulation of oil in combination with suitably arranged baffles should result in more uniform internal temperatures, and consequently lower rate of insulation deterioration than when thermal action is relied upon for oil circulation. Experience to date indicates that transformers of the forced-cooled type meet practically all operating conditions and it is anticipated that demand for them will continue.

*Question: Has the integrity of synthetic insulations been developed to the point where they will supplant rubber for low and medium voltages?*

MR. Borda—We must first define synthetics. There are many products loosely referred to as synthetics. There are roughly two major divisions, thermosetting and thermoplastics. The first requires vulcanizing but the latter does not. Koroseal has definitely proven itself as far as the low voltages are concerned, and has been successfully used as a sheath over other dielectrics and as a sheath over lead sheath to prevent corrosion. Neoprene is a thermosetting which requires vulcanizing; its physical characteristics are excellent, but its dielectric characteristics are almost negligible. Use has been confined to low

### Around the Table

**North**

**George C. Tenney, *editor*, Electrical West, *moderator.***

**I. W. Borda, *Pacific Coast manager, The Okonite Co.***

**W. H. L'Hommedieu, *central station manager, Westinghouse Electric & Mfg. Co.***

**Charley Grunsky, *chief engineer, Coast Counties Gas & Electric Co.***

**J. P. Jollyman, *chief engineer of hydroelectric and transmission engineering, Pacific Gas and Electric Co.***

**George E. Kimball, *electrical engineer, Industrial Accident Commission.***

**S. J. Lisberger, *chief, division of distribution engineering, Pacific Gas and Electric Co.***

**W. C. Smith, *Pacific District engineer, General Electric Co.***

**R. A. Wehe, *chief engineer, California Railroad Commission.***

**South**

**George C. Tenney, *moderator.***

**Alex A. Kroneberg, *electrical engineer, Southern California Edison Co. Ltd.***

**Frank A. Short, *engineer, Industrial Accident Commission.***

**C. N. Parker, *engineer, California Electric Power Co.***

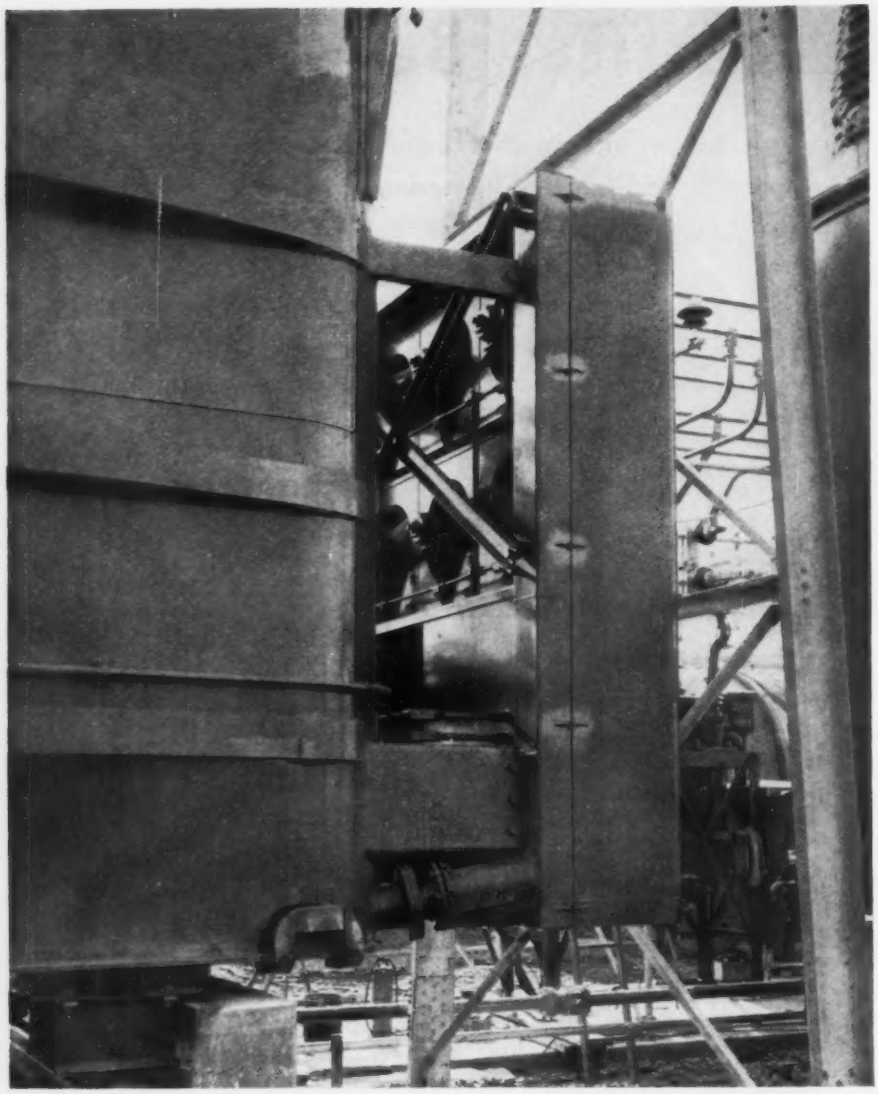
**Edwin F. Gould, *mill manager, Anaconda Wire & Cable Co.***

**Clem J. Nevitt, *engineer, San Diego Gas & Electric Co.***

**P. L. Savage, *engineer, General Electric Co.***

**W. E. Row, *ass't manager of operation, Southern California Edison Co. Ltd.***

**R. A. Hopkins, *central station supervisor, Westinghouse Electric & Mfg. Co.***



**Will forced oil — forced air-cooled transformers like this 30,000-kva. unit at a California utility's substation find a place in postwar practice? The experts answered with a qualified "yes"**

voltages. Thiothol is similar to Neoprene, but does not have the mechanical characteristics of Neoprene. With Buna the trouble is that batches vary so badly that it is difficult to draw conclusions. I would say that the synthetics have definitely proved themselves as far as the low voltages are concerned and are well on the way to prove themselves on the medium voltages, but after the war we will probably again use rubber for the higher voltages from 11 kv. up.

*Mr. Lisberger*—I want to emphasize what Mr. Borda said. We must distinguish between the synthetics and those that are not synthetics. Koroseal is not a synthetic rubber, it is a plastic, so are many of the others. The industry is being plagued with these new synthetic rubbers because of the fact that factories are now in production. As the batches come from the mill they are very uneven and each batch must be sampled to determine just how it will act. In the low-voltage field it seems plastics have a real field. When it comes to high-voltage use of these synthetic rubbers, today we are quite ignorant.

*Mr. Savage*—In general, I would say that there is a synthetic insulation which can be used to replace rubber for all services where the voltage is 600 volts or less. There are special conditions where extremes of temperature are encountered where the thermoplastic insulations are not equal to natural rubber. However, I feel that there will be improvement of the Buna-S compounds in the very near future and that very likely we will have compounds which will entirely replace rubber with equal or superior results.

*Mr. Gould*—It is problematic and a matter of pure conjecture, as to the extent that rubber will be used as electrical insulation on wire after the present emergency. The supply of natural rubber may be limited for some time and experiments with synthetics are such that the rubber type of insulation would be outmoded. There are synthetics on the market now capable of use at high voltages and for which no protective covering such as braid or lead sheath is required. This indicates the possibilities in the development of synthetic insulation way beyond present performance. Doubtless more economical use of all materials will be vital in our postwar economy to conserve our natural resources. Development of new insulations during the emergency may result in a design of insulated wire for building purposes that would permit even higher current ratings than at any time in the past.

*Question: Can continuation of the use of bare neutral be justified for service entrances and interior wiring?*

MR. Kimball — In the National Electrical Code and the Electric Safety Orders of the Accident Commission, the electric committee has fought to a finish the use of bare neutral wire, but during this emergency the Navy, WPB, and others have suggested the use of bare neutral wire and have paid no attention to that requirement of the National Electrical Code requiring a covering, not necessarily insulation, but a covering over the neutral wire. We have not been able to justify the use of bare neutral because of the hazard we believe exists, and due to the fact that there is no scarcity of weatherproof insulation. Weatherproofing is satisfactory on neutral conductor on an interior wiring system, and we believe we are justified in still requiring such covering on the neutral conductor.

*Mr. Lisberger*—Our experience with bare neutral in services has been satisfactory and I see no reason why bare neutral cannot be used in services.

*Mr. Tenney* — This question was probably brought up by someone who has in mind the fact that this whole question of interior wiring, especially residence wiring, warrants a lot of study in view of postwar building and the demand for rewiring of all types when the war is over in order to take advantage of all the new electrical things the manufacturers are going to make available, and from this angle the answer has not yet been satisfactorily brought forward.

*Mr. Borda*—I think this is really two questions in one. As far as service entrance cable is concerned, bare neutral has proven itself from both a safety standpoint and from that of economy and service. It fits in with the existing switching arrangements, etc.

and has proven satisfactory generally. As far as bare neutral in interior wiring is concerned that is a different matter. Your saving in materials is negligible, and I would say that there is no excuse for it. In inside wiring I am told that 60% of the trouble that local inspectors have, resolves itself around small conductors, and we should not add to their troubles by using bare neutral.

*Mr. Gould*—The use of bare neutral in interior wiring has one distinct advantage and that is in the provision of a ready and direct ground for faults. Obviously, faults conducted immediately to ground are less hazardous than those maintained. For service entrance cables, exterior bare neutrals have been found very advantageous in the elimination of theft of current.

*Mr. Nevitt*—The use of bare neutral is undoubtedly justified in so far as its ease of identification, degree of safety, economy of use, and trouble-free service are concerned. However, as long as the National Electrical Code makes no provision for its over-all use, difficulties will exist in adopting it as standard practice. If NFPA would consider the facts of bare neutral, not allowing any emotional features of the case to influence their decisions, then there might be prepared regulations so that bare neutrals could be used if desired where they are satisfactory.

*Question: Should the practice of up-rating equipment be continued after the war?*

MR. L'Hommedieu — Up-rating may involve going beyond temperature limits which are recognized as safe and which if they are exceeded are bound to shorten the life of equipment. Or you may speak of up-rating equipment as using it up to its full capacity within temperature limits. Some up-rating can only be justified by existing conditions, and this is done at the expense of the life of the equipment. On the other hand, you can speak of up-rating as getting the most out of the equipment and still staying within safe temperature limits, and I see no reason why this should not be continued, i.e., operating machines within safe limits, using relays which are calibrated to proper temperature.

*Mr. Jollyman*—I quite agree with Mr. L'Hommedieu.

*Mr. Smith*—Name-plate rating is nothing but a yardstick and the operator has a great deal of latitude depending on the location of the apparatus and the type of loading. Since the war came on more consideration has been given to how much it will shorten the life of equipment to put on an overload at certain intervals. In many cases apparatus has not been sufficiently loaded.

*Mr. Hopkins*—From an economic standpoint up-rating in many instances is fundamentally sound in policy, and experience during the war emergency should demonstrate its effect and the extent to which the practice will become permanent.

*Mr. Kroneberg*—The practice of up-rating equipment had been used on the Pacific Coast before the war, especially in the case of generating equipment. Examples are 27,000-kw. water-wheel generators up-rated to 33,000 kw. and operated at that rating continuously, and 90,000-kw. steam turbo-generators operated at continuous loads of 100,000 kw. Transformers could be similarly up-rated, thus being operated on a temperature basis rather than on a name-plate kva. basis.

*Mr. Savage*—The present plan of up-rating motors has been a step in the right direction but, in my opinion, hard and fast rules are not desirable in normal times. Manufacturers have included a 15% service factor for standard motors which experience has indicated is about as far as we should overload a motor without affecting its life. I do not believe we are in a position to judge the results of the WPB's limitation order. It is true there has been little, if any trouble due to the present up-rating program. However, I believe that very few of the motors applied in compliance with this ruling have been in service long enough to give us a good picture. Although I am in favor of rating equipment more closely and making more use of its overload abilities, I believe it should be done through sound engineering and experience rather than by a set of rules.

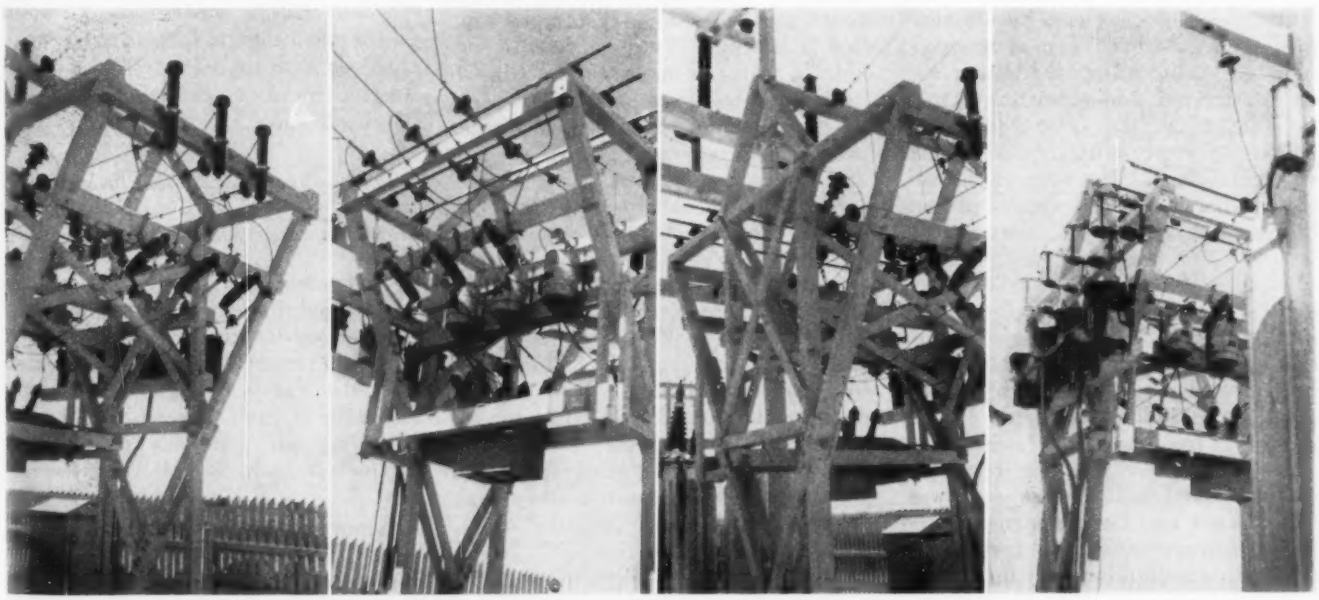
*Question: Will there be general replacement of the iron wire installed on rural circuits with copper or aluminum when these metals are available?*

MR. Lisberger—In general, much of the iron or steel wire that has been installed will have to be changed by reason of its character or by reason of load.

*Mr. Wehe*—How extensive is the use of iron wire at this time and in what type of sections and circuits will you install it?

*Mr. Lisberger*—It is installed solely in the primary circuits of 4- and 12-kv.

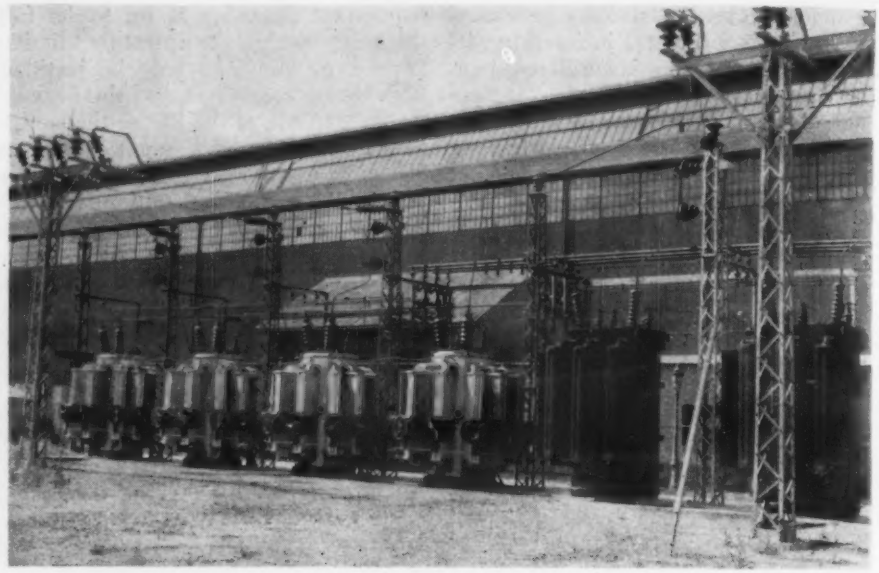
**Various angles of wooden wartime substation structures were discussed. Warping, weathering and fire hazard of wood may influence return to more sightly and permanent steel structures**



lines and its use depends on the requirements of WPB. In most cases loadings have been relatively light. I am inclined to say off hand that it has relatively little long-life use in the economic picture.

*Mr. Wehe*—This is how we in the commission look at it. Most of these problems resolve themselves into this question—what constitutes the least total cost of service over the probable total life? Along with that you must always consider the reliability and serviceability of the equipment. In relation to iron wire, we all know our general order does not prohibit it, but it has never been good practice, generally speaking, to use it. Where it is installed and where climatic conditions will permit its use and load conditions do not require its removal, such wire might be maintained throughout its economic life.

*Mr. Row*—When wartime restrictions are lifted on the use of copper there will undoubtedly be quite a marked tendency if not actual necessity to change out much of the iron wire now being installed in rural areas. It would appear that we will be guided in this matter by service requirements and load demands along with good engineering judgment as the final decisive factor.



This bank of water-cooled transformers on a Western utility system has undergone two changes in method of cooling, the last one being the addition of fans to radiators previously installed, with the result that they were up-rated 750 kva. each at a cost of less than $2 per kva. of increased capacity. The transformers rated 2,500 kva., 35° C. rise, water cooled, primary 31,215/54,000 Y volts, secondary 6,900/12,000 Y volts, were purchased in 1919. In 1928 they were moved to a steel mill and converted to self-cooled units because of lack of water by adding twelve 7-ft., 47-tube radiators to each. This gave a conservative rating of 3,000 kva. Recently load was increased and a blower system added for forced-draft cooling, resulting in an up-rating of 750 kva. per unit. Total cost per transformer for this installation was about $1,450.

*Question: (South only) Would it be desirable to retain the substitution of wood for steel in substation bus and switching structures?*

MR. Parker—After discussing the subject at some length Mr. Parker concluded by saying, to sum up the whole matter, I believe that after the war we will return to our former policy of using steel for all except minor or temporary substation structures.

*Mr. Row*—Recent use of wood members indicates that a modern wood structure, using all treated timber, can be constructed under wartime conditions at about the same cost as an equivalent steel structure under prewar conditions. However, it is estimated that under normal conditions the wood structure would cost approximately 25% less than that of steel. Why then should we not take advantage of the reduced cost of wood in normal times. The answer, I think, lies far back of us in the days when fire amply demonstrated the wisdom of going from indoors to outdoors and changing from wood to steel structures, and that compelling reason is just as sound today as it ever was. Permanency and low maintenance and higher salvage value also favor steel. Giving consideration to these and other factors involved, I am of the opinion that wood would not supplant the use of steel for the purpose under discussion.

*Question: (South only) Are there any advantages in the use of pentachloro-phenol in place of creosote for the treatment of timbers?*

MR. Nevitt—Laboratory tests show that pentachloro-phenol is about ten times as toxic as creosote, that it is only a fractional part as soluble in water as creosote, and that it has very low vapor pressure. From a practical standpoint its advantages over creosote are that it is a product of uniform consistency; it can be dissolved in a selected solvent to give any desired per cent of toxicity, and it may be dissolved in evaporative solvents to leave a surface which may be painted. All problems in its use have not been solved. With the advent of a large supply of creosote resulting from iron and steel production, it now seems doubtful that any change will be made to general use of the pentachlorophenol as a preservative for wood poles, unless of an unsatisfactory quality of creosote or a large price differential.

*Mr. Parker*—I believe that pentachloro-phenol is somewhat harder to handle than creosote and that the penetration is not so good. The experience of industry in the use of pentachloro-phenol in the treatment of poles is very limited, while we have an established record of the preservative values of creosote. In 1942, the Southern California Edison Co. treated over 4,000 poles with this preservative and after 20 or 30 years we will know whether it is a satisfactory material. In the meantime it seems desirable to continue with the use of creosote until we have more evidence that it has lost its effectiveness.

*Questions: (North only) Continued use of women in industry and bi-monthly billing after the war.*

THE comments of several who discussed these questions might be summed up by saying that it was felt that the question of retaining women after the war is one that will largely take care of itself. Likewise, bi-monthly billing will gradually fade out of the picture as it did following the last war.

Report of other parts of the operating Economics Section program is contained elsewhere in this issue.

# Instruction By Job Breakdown Method

## Idaho Power successfully applies new method of employee training that suits the peculiar war needs of the utility business

FEELING that the Training Within Industry program of the War Manpower Commission did not apply well enough to the training of new personnel for power plant operation and maintenance, Ed Woodhead, power plant superintendent of the Idaho Power Co., developed a job problem breakdown method of instruction that has successfully met the needs of the utility business. The Training Within Industry program, he felt, instructed men in a step-by-step method which would not work where personnel was expected to do a great variety of jobs such as encountered in power plant construction and maintenance. It is different when training a man or woman to do a lathe job, for instance, where only one operation is involved. Such a person, however, cannot go to another job without another similar training approach.

The new training method being used was designed to assist any superintendent to accomplish a certain job operation where the men must do many disconnected things every day in relation to each other. In this procedure the job is broken down into job units that come within the specified time limit that has been set. When men are delegated to do a job they are expected to dovetail it into the allotment of time. The cost involved is set down in the job problem sheet here illustrated, so that it can be appreciated by the trainees and their efforts turned to doing the job within the cost estimate.

Briefly, the main job is broken up into job units and then job unit operations in which the sequence of physical performance within the job is discussed. Emphasis is placed upon all logical segments of the work, the performance of which will advance the job. Known facts related to job unit operations that must be considered if work progresses with confidence as to final outcome, must be brought to the attention of the group involved. And finally, crew requirements and allocations of advisory authority must be understood.

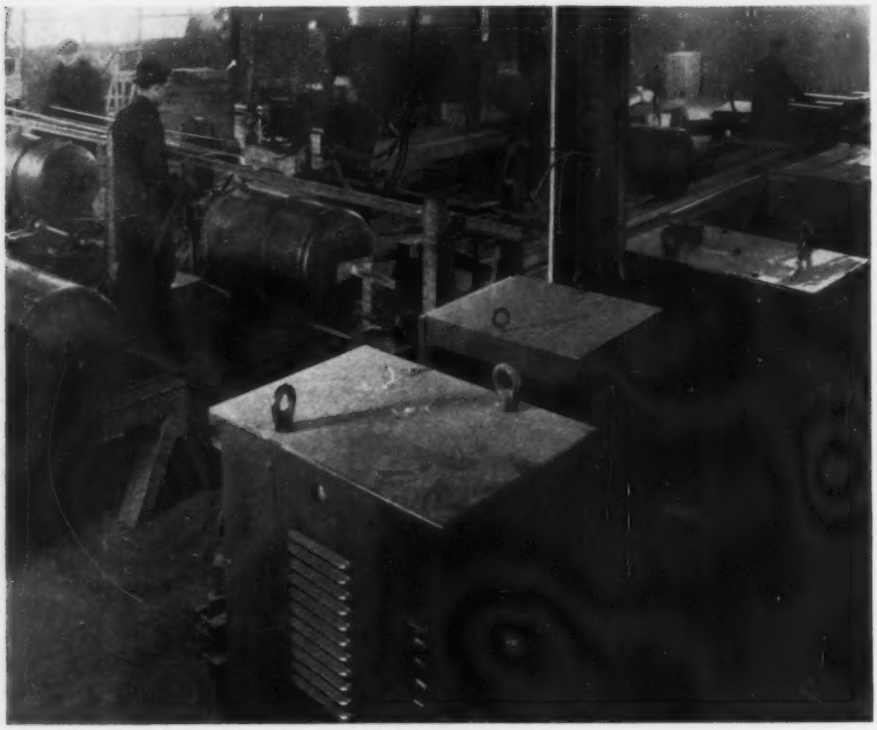
By this approach to the job problems, it has been found that much time is saved, less confusion prevails, accidents are much less likely to happen and a better degree of control over costs results.

**Typical job breakdown sheet for complete overhaul of a generating unit**

JOB: Overhaul Complete Unit PLANT: Any DATE: April 30, 1943

REMARKS—Known Job Facts: Capacity 6,000 Kw. Loss each 24 hours 144,000 Kwh. Loss in return at $.003 equals $432.00 each day. Stator winding damaged. Shaft not plumb within .130". Stator must be realigned to rotor, redoweled, and reanchored. All bearings to be inspected and repaired. Turbine runner to be metallized. Speed ring vanes to be repaired where broken. CREW REQUIREMENTS—Shifts, 2; Men, 5; Days, 1.

| JOB UNITS Preferably, but not necessarily in order of performance. | JOB UNIT OPERATIONS Sequence of physical performance within job unit. Any logical segment of the work the performance of which advances the work. | PROTECTION TO MEN AND EQUIPMENT List all accident prevention measures opposite Job Unit Operations. Underscore important accident prevention measures. | CONTROL POINTS Skills or conditions which, if neglected, would cause the job to suffer. Anything in the Job Unit Operation that might make or break the job. | KNOWN FACTS Related to Job Unit Operation that must be considered if work progresses with confidence as to final outcome. |
|---|---|---|---|---|
| Preliminary. | Check and determine if water has been removed, gates locked, and switches tagged. | Extra instruction in safety must be given. Be sure that all precaution against accidental opening of head gates and closing of switches has been taken. | Conditions suggest the need for close and constant supervision and unbroken attention by every one to avoid accident to men and equipment or delays in the work. | A critically needed generating unit is out of service. Inexperienced help will be employed. |
| Dismantle down to and including rotor. | Uncover generator by removing hood. | Check head gates and switches against accidental operation.<br>Operation of crane must be assigned to capable operator.<br>The giving of signals must be assigned to an alert and experienced workman.<br>Designate signals and be certain all signals are fully understood.<br>Choose tools carefully. Use socket wrenches. Be concerned about workman's ability to use wrenches safely. | Experienced crane and signal men are essential. | |
| | Inspect crane, electrically and mechanically; lubricate. | | | |
| | Assign dependable member of crew to keep tools and parts in proper order. | A workman to keep premises clean and small tools in place is highly worth while. | Adequate containers should be provided for small parts.<br>Parts should be match marked. | Precautions have been taken against accidental opening of gates and operation of switches. |
| | Select rigging and prepare steel cable slings. | Keep all oil and dirt from under foot.<br>Be alert for good housekeeping.<br>One ¾" plow steel cable, with loop at each end and long enough to place each loop on crane hook for two parts with ¾" crew shackle at lower end, is recommended. | Location for storage should be determined.<br>Crane man receives signals from signal man only.<br>Position signal man so signals are received clearly.<br>Use safety factor of six on cable. | Hood weighs about 1½ tons. |
| | Spot crane over center of load. Install sling. | Use two ¾" Crosby clamps at each loop with U of clamp on loose end.<br>Do not use bad cable.<br>Look out for kinks and ragged wire ends and leave no loose ends.<br>Protect hands always. Ragged wire ends are dangerous.<br>Inspect lifting eye. Look for cracks in steel plate near eye.<br>Make sure of footing. Be particularly alert when on sloping steel surface.<br>Be fully concerned about the danger of metal shod shoes. Shoes with leather soles and rubber heels are recommended. | Unnecessary delay and confusion will result by not providing adequate containers for small parts. | |
| | Match mark parts. | Check for free movement.<br>Crane man must receive signals from signal man only. | | |



Welding tanks by Unionmelt process. The a-c welders are in the foreground

# A. C. Welders—Construction, Operation—1

*Vernon B. Wilfley*
Engineering & Service Department
Westinghouse Electric & Mfg. Co.

ALTERNATING-CURRENT arc and resistance type welders, their construction and operation, and a few points in connection with safety measures and coverage by the National Electrical Code are to be discussed in this article, which will appear in two parts. The first will treat of construction, operation and characteristics of a-c welders. The second will deal with safety measures and the Code.

For many years, there has been a steady trend toward increased use of electric welding in all branches of metal fabrication. This trend has been greatly accelerated recently by the production requirements of the war emergency. This is especially so in the case of a-c welders of all types.

Due to this rapid expansion and because there is no adequate coverage of either a-c or d-c sets by the Code at the present time, the installation and operation of such equipment requires additional information.

The ordinary arc welder obtains its welding heat by drawing an arc in the secondary circuit of the welder, the arc depositing electrode metal to the heated work. The resistance type differs from this in that the welding heat is obtained by contact resistance between two pieces of metal under pressure with no visible arc.

The simplest form of welding would be the direct connection of the electrodes and work to a commercial power source. However, intermediate equipment is necessary to obtain energy having suitable arc characteristics. This energy is supplied from a d-c motor generator or from a welding transformer. In one case the arc is maintained by direct-current and in the other by 60-cycle a-c. Single operator a-c sets range in current rating from 100 to 1,500 amp. and their use is often extended by paralleling the units to obtain high arc currents, such as the 4,000 amp. used in the Unionmelt process.

Since Westinghouse manufactures d-c as well as a-c arc welders and all manner of electrical equipment for the resistance type, the confining of this discussion to the a-c welder does not signify that its use is advocated for all conditions. A choice between the a-c and d-c arc welder should be based upon a study of the requirements of the work and of the power supply. Often, personal opinion or lack of experience on one or the other type are factors in the choice.

### A-C Welding

An a-c transformer type arc welder consists, merely, of a two-winding transformer and an adjustable series impedance. The series impedance, which is usually resistance, has two functions, namely, stabilizing the arc, which is necessary because of its negative resistance characteristic, and to provide means of adjustment for various current settings. The use of reactance as the series impedance as compared to the use of resistance has several advantages which will be referred to later.

The use of a-c for welding was first advocated some thirty years ago but was retarded due, largely, to the non-development of a suitable coated or fluxed electrode. Such an electrode is necessary with a single-phase 60-cycle arc to provide shielding, heat retention and the maintenance of an ionized path through the period of zero current. For both a-c and d-c arcs, the chemical coating of such an electrode forms a gaseous envelope around the arc, thereby excluding atmospheric oxygen and nitrogen from contact with the molten metal. It also serves as insulation to the operator when changing rods and affords low-temperature ionization.

Since the development a few years ago of such special electrodes, the use of a-c for welding has expanded tremendously. Previously, an auxiliary high-frequency stabilizing equipment was used to overcome the current zero difficulty and is still used to some extent on special low-amperage sets, but this had the objectionable features of extra cost and complication. At the present time, coated rods are used almost universally on both d-c and a-c sets.

Due to recent requirements of the

* A paper presented Aug. 27, 1943, before the International Association of Electrical Inspectors, at Seattle, Wash.

aircraft industry for welding special alloy light-gage parts, we have developed a new design a-c set with high-frequency stabilization. This set is rated at 175 amp. and has an operating range of 10 to 200 amp. It is of particular value where it is desired to strike the arc without burning through or marring the surface of the work.

For a-c welders there are three commonly used methods of obtaining the desired current settings. One is by means of changing taps on the transformer secondary winding or on a series impedance. This method is simple and inexpensive but permits no vernier adjustment between taps, and settings cannot usually be made while the set is in operation. It is used only on the welders of small current rating.

A second method is by means of a movable coil reactor which functions to change the secondary current setting by changing the position of the coils with respect to each other. This method is similar to that used in the well known constant current regulator. This method has the advantages of an infinite stepless control of current and adjustments may be made while welding. The principal objections are mechanical weakness, the necessity of using leads which are subject to flexation and the fact that the relation between coil position and current setting is not linear, which tends to crowd the current settings at the higher values.

The third method and the one most commonly used on a-c arc welders is that of the movable core reactor. This provides stepless control, current adjustment while welding and is superior to the second method mentioned above in that the coils are fixed in position and no movable or flexed leads are used. Also, the relationship between current setting and core travel is practically linear which permits a better scale on the current setting dial. Its only disadvantage is the need for care in design to prevent undue vibration and noise.

As mentioned previously, nearly all a-c welders use reactance for the series impedance since this gives good efficiency, reduced ratio of short-circuit current to welding current and good inherent stability. Volt-ampere curves for a-c sets using series reactance show that it is typical to have only a 15% variation in current for a change in arc voltage from the normal load voltage of 40 volts to short circuit. Also, the large phase angle between the arc voltage and current usually results in a voltage at time of current reversal having a value of about 86% of its peak. This aids in immediate re-ignition of each half cycle of current and results in the reduction of "dead periods" to a minimum.

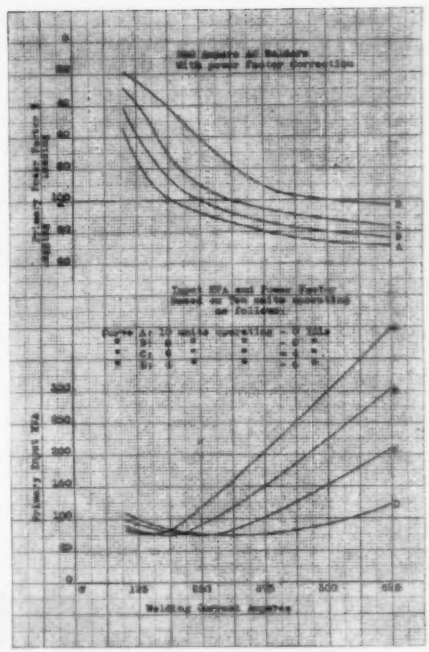
The maximum open-circuit voltage of a-c arc welders has been limited by the National Electrical Manufacturers Assn. to a value of 80 volts. New developments in coated electrodes will, undoubtedly, result in reducing this value still further in the future, resulting in lower kva. input and improved inherent power factor. For certain types of work and with many present electrodes, an open-circuit voltage of 50 volts is adequate but, to insure satisfactory welding for all operating conditions, present designs of a-c sets are based on 80 volts. It should be remembered that allowance must also be made for low primary voltage since this directly affects the secondary voltage.

Alternating-current welders are often operated in parallel to obtain the combined current output at the arc. Such an arrangement requires only that the welders be connected to the same primary phase and that the current settings be, approximately, the same. Such sets may be of the single or the multiple operator type. With the multiple operator system, a three-phase transformer with star-connected grounded secondary may be used.

The a-c transformer type welder has a number of advantages when compared with the d-c unit.

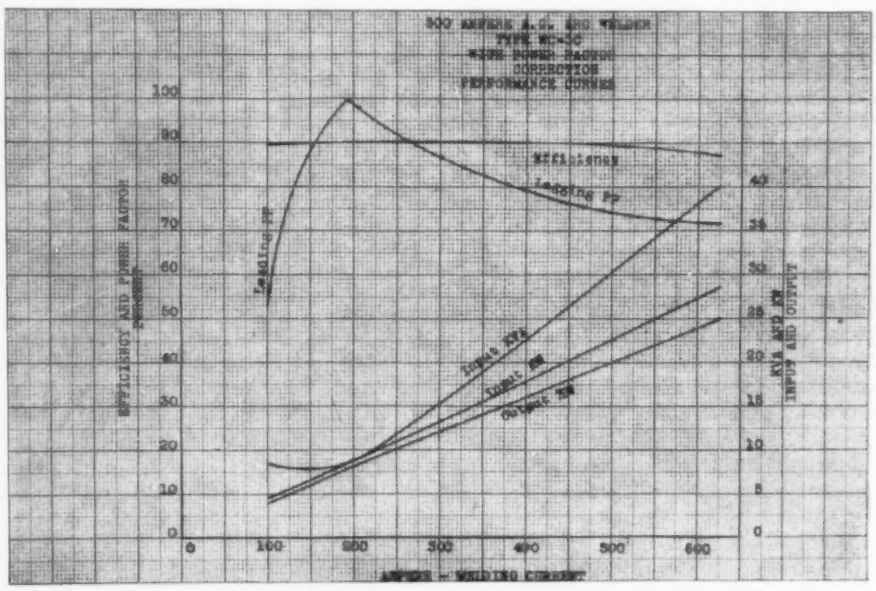
The simplicity of the a-c equipment and the elimination of rotating parts mean, in general, lower first cost, reduced space requirements, less maintenance, and an important saving in critical materials in the construction.

The efficiency for the a-c unit will be about 85 to 90% as compared to 55 to 60% for the d-c, due to the inherently better efficiency of transformers as compared to motor-generator sets. For the no-load or non-welding condition which exists about 60% of the total time, the a-c losses will be about one-fifth of those for the d-c set. In many cases, it has been shown that a monthly power saving of 30% or more is possible by the use of a-c. It should also be noted that the better efficiency for the a-c units will permit the use of a larger number of sets for the same power supply capacity.



**Why study is required to prescribe capacitors; effects on input and pf. of various 10-500-amp. units. At 500-amp. setting over-all pf. between 75% lagging to 100% for cases A to D. At light loads kva. leading obtains**

Another very important advantage in favor of the a-c welder is the decided reduction in magnetic arc blow which,




**Typical performance of 500-amp. high power factor a-c welder. Note leading pf. at light loads and also values for loads between 200 and 500 amp.**

briefly, is a distortion of the welding arc caused by magnetic fields in and around the arc path. The elimination of this effect in the a-c arc, because of the rapidly changing polarity and the induction of damping eddy currents in the work, gives the a-c equipment a decided advantage especially in fillet and corner welds. The subject of magnetic arc blow is one about which a complete paper could be written and it can only be referred to briefly here.

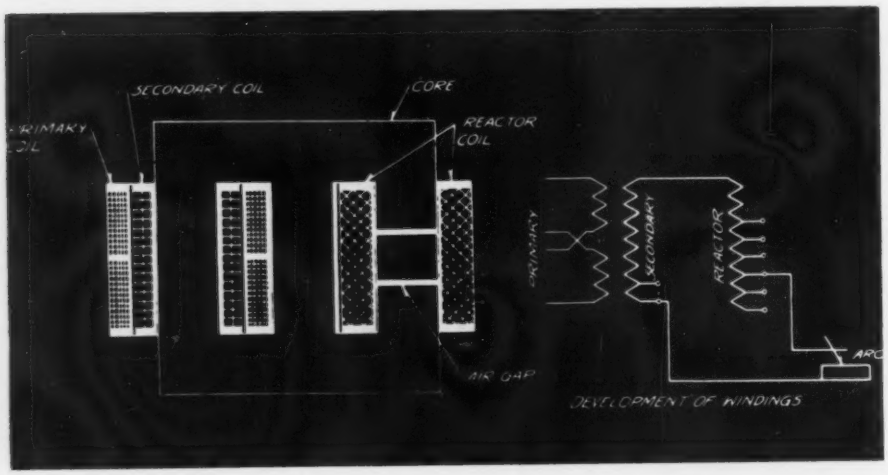
The stabilizing reactance in a-c welders is instantaneous in action whereas the sluggishness of the d-c field tends to give rise to inherent transient characteristics involving current and voltage over-shooting and "time of recovery." Also, generator characteristics have no effect on the operation of the a-c welder because the latter is usually connected to a power source of relatively large capacity whereas the d-c arc characteristics are likely to be affected by the limitations of the d-c generator.

Tests indicate that the a-c weld will have about the same penetration as d-c at high currents, while at low currents the penetration will be less. This latter characteristic is an advantage in the welding of light-gage materials. Other tests have shown that an a-c weld is, at least, as strong and in some cases as much as 10% stronger than a d-c weld under similar welding conditions.

One disadvantage of the a-c welder is that it constitutes a single-phase load on the power supply and will tend to cause phase unbalance. However, this is usually compensated for by the fact that either the welding load is small compared to the total three-phase power load or that there is sufficient single-phase welding load to permit balancing on all three phases.

The necessity of using a coated electrode has been cited as a disadvantage of the a-c set but this is not now a serious item since similar rods are used very generally with d-c welders.

The power factor characteristic is important on any type of equipment. For a-c welders it is necessary to have a low inherent power factor and this may be as low as 55 to 60%. However, this objection is nullified by the fact that built-in capacitors are available with all a-c welders to improve the power factor to between 75 and 90% from half load to full load. At no-load the power factor is leading which aids in improving the over-all plant condition. The use of built-in capacitors should be determined by a study of plant conditions since in many cases greater savings and improved over-all power factor conditions may be effected by banking capacitors on primary buses or by installing less built-in capacitance per welder than would be considered desirable based upon an off-hand estimate.




**Steps obtained by tapping segregated reactance instead of secondary winding**

During visits to various shipyards, some operators have advised that the a-c weld was somewhat more difficult to use on certain types of vertical and overhead work whereas others state definitely that there is no difference as compared with d-c. All seem to agree that the a-c arc is much superior on horizontal fillet and corner welds, due to elimination of the magnetic blow. I feel certain that the use of newly developed coated rods will eliminate the partial objection mentioned.

Like all other manufacturing organizations, our company makes a special effort, especially in time like these, to keep the number of items on its development and manufacturing program to a minimum to save labor, expense and the use of critical materials. This is a direct contribution to the war effort. However, it is essential that the entire range of the requirements for any type of equipment be adequately covered.

The general purpose, manually operated a-c arc welder, the type in which inspectors will be most interested, covers a welding current range up to 500 amp. secondary rating. Our standard ratings at present are 100, 200, 300 and 500 amp. These are obtainable with or without built-in capacitors for power factor correction and are designated as the type NPF or HPF types respectively, meaning normal power factor or high power factor, also respectively. The problem of supplying built-in capacitors on dual voltage primary sets is rather a difficult one. In the case of the Westinghouse HPF sets, this has been taken care of by a special connection in the transformer winding.

At the present time, the 100-and-200 amp. sizes are listed by the Underwriters' Laboratories. Thus far, no larger sizes of a-c units nor any d-c units are so listed.

All Westinghouse Flexarc a-c welders employ natural self-air-cooling, Class B insulation, special varnish treatments for heat and moisture proofings and the Underwriters' Laboratories specifications are followed in the design and construction. A reduction in the size and in the amount of materials could be made by the use of forced or fan ventilation, but it is our feeling that all equipment should be made as simple as possible and all unnecessary auxiliaries eliminated at the present time in view of the war emergency and the continuously overloaded operation required by the shipyards and other important manufacturing companies. Visiting some of the shipyards near Portland, at one plant, where they are operating over 200 of our 300-amp. a-c sets, the work requirements are such that it has been necessary to operate the equipment at current values far above the normal rating of the sets. For example, the normal range on the standard 300-amp. a-c set is 60 to 375 amp. Due to necessity, the shipyard referred to has arbitrarily changed the core adjustment to permit obtaining currents up to 440 amp. The heavy production schedule, under which such yards are working, sometimes necessitates such steps. So far, in this case, no maintenance troubles have been encountered. Any auxiliary equipment can be as much a source of trouble as the main equipment itself and should be eliminated.

With reference again to our a-c welders, the over-all welding range for the four ratings mentioned above is from 20 to 625 amp., and all units are rated on the new duty cycle as given

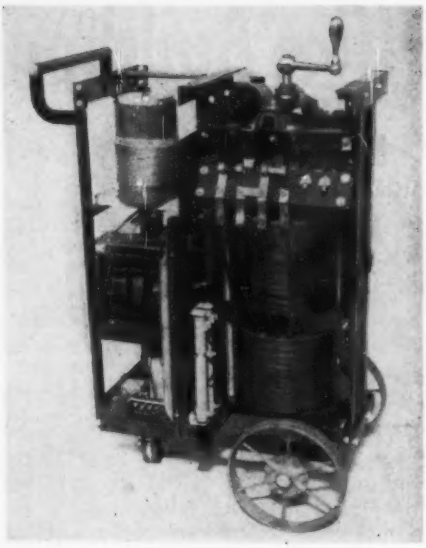
in the NEMA Standards, dated December 1942.

The features of construction and the characteristics for these sets vary somewhat depending upon the ampere rating.

For the 100- and 200-amp. sets, the current setting is selected by plugging in the welding cable terminal plugs to a terminal board receptacle to which various current taps are brought from a secondary reactor. For the 100-amp. set, 15 steps are available between 20 and 140 amp., and for the 200-amp. set, 27 steps between 20 and 250 amp. The recommended electrode sizes are from 1/16 in. up to 5/32 and 3/16 in. diameters, respectively. The open-circuit voltage will vary between 50 and 80 volts depending upon the current tap used. These sets are designed for single-voltage supply only but may be obtained for any of the standard voltages such as 208, 220, 440 or 550 volts. A built-in Deion air circuit breaker which serves as a disconnect and circuit protective device is provided in the primary leads. Both of these sizes are portable and have suitable running gear.

For the 300- and 500-amp. sizes, which are more commonly used in industrial service, current control is by the movable core method previously referred to, which gives an infinite variable set of adjustments from 60 to 375 and 100 to 625 amp., respectively. Recommended electrode sizes are 3/32 to ¼ in. and ⅛ to 5/16 in., respectively. Incidentally, with reference to the shipyard operation mentioned above, ¼ in. rod is being used in practically all operations and it is, also, common practice to use 5/16 and ⅜ in. rods with the nominally rated 300-amp. sets readjusted for an output of 440 amp. The maximum open-circuit voltage on these sets is 80 volts. Both sets are designed for dual voltage primary supply. The 300-amp. set has built-in type AB breaker protection but external circuit protection must be supplied by the customer for the 500-amp. size. This is because the location of the 500-amp. size is usually semi-permanent and exterior disconnect means and circuit protection normally will be supplied by the user. Running gear is furnished with the 300-amp. set but not with the 500-amp. set.

Arc welders above 500-amp. rating, such as 750, 1,000 and 1,600 amp., are usually applied to machine operation, such as the Unionmelt process, but are also adaptable to manual welding and cutting. The general construction characteristics and current control methods are the same as for the larger types already discussed except that motor-operated current selection is generally used with either local or remote push button control.



**For special alloys of light gage in the aircraft industry this modified high-frequency stabilized a-c. welder supplies current to the arc from a finger-tip switch in the electrode holder and allows striking an arc on thin sections of cold metal without burning through or marring the surface. Shown with case removed, this model is rated at 175 amp., current range 10 to 200 amp.; uses moving core; has high-frequency equipment mounted in same frame. Open circuit 80 for low; 55 volts for higher current range is obtained**

Most of the larger sized welding transformers are designed for and used with the Unionmelt process as developed by the Linde Air Products Co. This process, which is finding widely expanding use in heavy welding work, differs from either the arc or the resistance types in that, though weld metal is transferred from the rod to the work, the requisite heat is obtained from the combination of the resistance of the work or parent metal, the electrode and the Unionmelt flux. The last named material is known by the trademark "Unionmelt" and is a special patented substance which in the process is flowed over the weld and serves several important functions. It permits the use of higher current values, brings about a rapid generation of intense heat in a concentrated zone, acts as a cleanser for the weld metal, absorbs impurities from the molten base metal and, also, functions as does the flux on the ordinary coated rod in that the atmosphere and foreign gases are excluded from the weld.

Several special machines using the Unionmelt process have been developed for shipyard use. One which I observed recently is a double seam welder with a motor-driven carriage and automatic rod and flux feed, operated by two men, for flat work giving a welding output of over 1,000 ft. per eight-hour shift.

### Resistance Welding

The subject of resistance welding is also one on which a considerable amount of time could be spent. However, my reference to it in this paper will necessarily be brief. The transformer used in resistance welding is similar in general construction to the arc welder type already described. The term resistance is used to distinguish the welding process from that of the ordinary or continuous arc weld. If an electric potential is applied across two electrodes, usually copper, which in turn press together two pieces of metal, the resistance of the union of the two metals and the heavy current forced through the junction causes a high $RI^2$ which results in sufficient heat to fuse the metals together. No metal is transferred from the electrodes and the weld is a bonding together of the two pieces of work. Careful control of the pressure, heat and timing is essential.

The ordinary type of resistance welder uses a single-phase transformer which is similar in most respects to those already described. Due to the "spot" welding characteristic of the operation, the demand is small compared to the momentary power used. The high momentary current inrush and the frequency of such inrushes often give rise to bad voltage conditions, depending upon the capacity of the power supply. A shunt capacitor such as is ordinarily used on the arc welder will not correct for this condition and use is often made of capacitors connected in series with the primary of the welding transformer. Such a series capacitor serves to cancel the circuit reactance and can reduce the momentary kva. demand to approximately the energy component level. During the welding operation, it also serves to bring the power factor close to unity. Since it is instantaneous in its effect, voltage dips can be very materially reduced.

Two special forms of resistance welders are designed to permit the use of balanced three-phase supply. One of these, developed by the Sciaky Brothers, uses the principal of storing rectified magnetic energy and discharging it through the pieces to be welded under accurate timing, heat and pressure control. The second type is similar in general operation but discharges a capacitance into the transformer and a heavy momentary current is discharged into the work.

# First Blackout Office Building

## Consolidated Vultee at San Diego erects windowless office building, air conditioned, fluorescent lighted

FIRST large windowless office building in the West is that of the administration building for Consolidated Vultee Aircraft Corp. in San Diego which was completed recently. Being windowless, the building naturally depends upon electrical facilities both for all illumination and ventilation. While the engineers claim nothing extraordinary in the wiring design, several features of the structure are of considerable interest because the building is the first of this type for office purposes. Blackout or windowless buildings have been erected for department stores and for war production plants but this is the first windowless office building.

The Consolidated Vultee administration building in San Diego is a seven-story and basement building containing 19,600 sq. ft. of floor space per story. It is of reinforced concrete. An exception to the blackout construction is the top floor, which includes large windows on all four sides for observation purposes. The building is also earthquake resistant and provides protection from possible nearby demolition bomb hits.

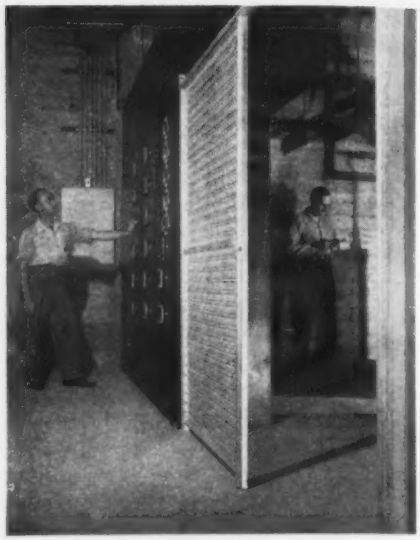
Precast floor joists resulted in a large saving of materials. Outside walls are 8-in. reinforced concrete which include definite column structure that will permit postwar cutting of windows, although present plans do not call for doing this. Ceilings and permanent walls are celotex lined to reduce noise.

All floors except the basement are provided with a floor duct system for telephone and office equipment power lines. The ducts contain spaced outlets. The top floor includes additional floor ducts for an executive intercommunication system. The lighting system is placed in the ceilings, separate from the floor duct system. Fluorescent lighting is used throughout.

For ventilation, individual floor fans supply air from the outside by means of a well extending the height of the building. Air is partly recirculated through louvre doors and partly expelled to a second well, also extending the entire eight floors. When necessary the air is heated at a point adjacent to the fan delivery. Temperature is governed by thermostatically controlled dampers. Each floor is divided into several zones of ventilation, each zone served by its own main supply and thermostatic control.

**Typical multibreaker lighting panel of which there are two on each floor**

**Lighting of corridors and offices is accomplished with four-lamp fluorescent Mitchell units. An auxilliary battery system supplies emergency lighting through Ivanhoe Trojan fixtures in each hallway and stairway and in important offices should power be cut off temporarily. Automatic relay cuts it in**



**Main lighting switchboard and a corner of the transformer room. Distribution is at 120/208 volts, 3 phase, 4 wire**

Power is brought to a main switchboard and transformer room in the basement. Distribution is carried through the building three-phase, four-wire secondary at 120/208 volts. The switchboard is a Square D and is completely equipped with breakers. Three 24-circuit panels are typical for most floors, all of multibreaker type. Lighting of the offices and corridors is done with Mitchell U.R.C. fluorescent fixtures, usually of the four 40-watt lamp size.

Because the basement is below water level, sewer lines are laid down in the sand fill beneath the basement floor where sewage is collected in an enclosed sump. From here it is pumped up to the city sewage main by electric pumps. No connections were cut through the membrane of the basement floor, which has been completely waterproofed to prevent seepage.

Electrical work was installed by Capital Electric Co., San Diego.

● *How Can I Avoid Wasting Light* has been prepared as a booklet by the Westinghouse Lamp division to assist in publicizing the electric conservation program of the War Production Board. Written by Myrtle Fahsbender, director of home lighting at Westinghouse Lamp Co., the booklet tells where to save and where not to save on illumination. The booklets are one cent each.

# Sharp Remarks About Lighting Future

## IES president tours West bringing forecast of things to be expected in illumination; tells work of society

IES President Howard Sharp, standing, Romaine Myers, San Francisco chairman

TWO things Howard M. Sharp brought the lighting industry of the West in his tour as president of the Illuminating Engineering Society. To the industry at large he brought a balanced, well-reasoned, yet constructive preview of the lighting opportunities and applications of a postwar world, based on considered projection of today's uses and developments in lighting science and art.

To members of the Illuminating Engineering Society he brought the first comprehensive view of the inner workings, the policies and the philosophy of the society which many members have ever received and few past presidents seemed to think necessary. To a scattered membership, isolated by great distances from the councils, the committees, the researches of the society, this brought the IES into close focus. It made them feel their tie with it and their responsibilities as members of this professional society.

### "What's Ahead in Lighting"

That the availability of new light sources will require more imagination, greater skill, and a keener appreciation of color in the design of lighting applications was the conclusion Sharp drew at the close of his talks before industry groups. Little of either was needed when the only tool a lighting man had was an incandescent lamp on a cord. The more limited intensity flexibility of fluorescent and mercury sources, their peculiar color characteristics, and their relatively high first cost would require these skills and imagination for satisfactory application.

In the future more structures without windows, in which both atmosphere and illumination may be restricted, will require a closer coordination between lighting and air conditioning. To be expected too, he indicated, would be closer coordination of lighting with the architecture.

As to light sources he felt the filament lamp would continue to be widely used because of its simplicity, control possibilities and flexibility. Fluorescent, both hot and cold cathode, can be expected to be improved. The circuit is not simple, the ballast is in need of improvement, quicker starting is in demand, better color is still needed. Mercury lamps provide sources with control, but the color is undesirable except in "sweating" work locations. Mixed with either incandescent or fluorescent, color can be corrected.

*Industrial*—While war has brought higher levels of illumination into many more factories, much of it has been of the "rougher type" of installation and after war the field will be one of bringing to converted factories the refinements necessary for precision work and full comfort.

There are two types of glare—discomfort glare and disability glare. Many of the high intensity jobs still create discomfort glare because the brightness of the surroundings is in too great contrast with the light source and disability glare, although creating no sensation of discomfort, is too often encountered because of light flux directed at high angles toward the vertical. The entire environment is important, as well as the point of work. Lighting in surroundings should be very little below that on the work. Paint, wall finish, color, contrast all play a part. Visual efficiency will be studied and lighting adjusted to it.

Maintaining a 50-f-c installation once it is in, seems to be the real problem. "We cannot seem to interest anyone in taking care of their equipment."

*Commercial*—The larger stores plan remodeling and redecorating following the war. This means relighting as well. The trend is toward the dramatic, the architectural or built-in lighting, or fixtures against the ceilings that are inconspicuous of themselves but direct light upon the merchandise. The smaller stores have done very little with showcase lighting. Exteriors will be improved, many with luminous fronts, signs a part of the architecture. Cost and maintenance will determine how far this will go.

*Streets*—Dimout and shielding have made a demand for better street and highway illumination. In the past it was "little light to go a long way." Shielding has shown possibilities for reducing street light glare, more efficient distribution to the pavement.

*Residential*—In the home field it is hard to say what the trend will be. If houses are to be prefabricated, with aim at low price, lighting equipment will be skimped. Wiring and fixture allowances even in $6,000 class of homes have been inadequate in the past. Sharp said he did not look for much built-in or dramatic lighting in homes, first because of cost, also because of human nature. Women like to move furniture and will need to move lighting with it. Portable lamps will still be preferred.

Fluorescent may not take because of color, although in kitchens and bathrooms there is a big field for it. In portables he did not look for much fluorescent used because of the size of equipment and the color of light, although combined with incandescent there are possibilities. He felt however that many other improvements will come—more accessible switches, cords that wind up in the base, silent wall switches, luminous switches, lighted house numbers, stairway and step lighting.

For those rooms or places in which reading, sewing or study are done, he looks for more lighting intensity, but feels that to expect women to want a general high level of illumination is not to understand women. The decorative element also intrudes in home lighting.

Since lighting is subjective and exists only in the eyes of the beholder, Sharp stressed the engineering of illumination always with the interest of the consumer as paramount. The society, he promised, would develop performance specifications and illumination data which the industry could put to work to bring such satisfaction to consumers.

### "Whose Society Is This?"

To the sections and chapters of the Illuminating Engineering Society in the West Sharp came to present the society, in lieu of the usual annual convention. To the majority of members, unable to attend a national convention anyway, his consideration of their needs was possibly of greater value than such a convention.

The IES, said President Sharp, is

bigger than any of its members or companies. It belongs to and is the public responsibility of its members. It belongs also to the consumers of lighting. Members, realizing this, at all times will resist any attempt to commercialize it, will be alert to have it remain the impartial, professional and technical organization it is. By that attitude it can render its greatest service to the consumers.

Sharp described the organization, its council, officers, committees and the policy relating to their selection and findings. He then analyzed the purpose of the society at its founding, ". . . the advancement of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto."

Theory, he explained, meant the body of fundamental principles underlying a science—and science meant an exact and systematic classification of knowledge. Theory, by this definition, could not be opinion or conjecture, it must be basic principle. Practice, he said, is doing, applying, making useful. In disseminating knowledge the society differed from other groups in that it carried the art and science of illuminating engineering to the consumer. Art, he said, pertains to usefulness, science to knowledge. The responsibility of disseminating knowledge includes, he felt, the development of correct applications and luminaires.

Educational programs of the society were then described. First is a training program being developed for men applying lighting in the field, first an elementary, then more advanced and finally a laboratory course. A handbook of illuminating engineering is in preparation, which is to contain basic and application data. A technical secretary is being added to the headquarters staff.

Organized research in illumination will be carried on in the name of the society by the colleges and universities of the country under a new program which will be financed by the industry through the society. Advantages of this procedure are that colleges have equipment, facilities, undergraduate manpower, and that all their findings must be published, nothing withheld.

The IES portable lamp program he discussed frankly, discussing its aim, accomplishments and some criticism it had received. The latter was due largely to the disinclination of the public to read accurately. The society had supplied specifications only, derived no fee from the lamps. The society would undoubtedly continue to prepare performance specifications for other types of lighting but not lend its name to certification tags in the future.

Prof. L. M. K. Boelter of U. C. and Dr. Leland Brown of Stanford, above, while H. H. Robison, secretary, S. F. Bay Section, chats with Fred Wellhouse, regional vice-president IES, and OCD official

The group interested in each field probably would set up its own certification process, as the residential lighting fixture manufacturers have now done.

An educational film illustrating basic lighting principles and applications of them to industrial lighting is in preparation by the society, Sharp announced. It is not a war industry film, but will be useful educationally to industry for many years.

A society of this kind, concluded Sharp, allows a man to live beyond himself, to make a contribution to society without a monetary return. It permits him to increase his technical stature and that of his industry.

## Explosion Code

Where electricity and flammable liquids, gases, chemicals and explosives are both involved reference to a new National Fire Code for the flammable and explosive materials, recently issued by the National Fire Protection Assn., may prove of value to electrical inspectors and electrical engineers. Many references to Article 500 of the National Electrical Code are made and much related information on various safeguards for hazardous locations is included. In cases where the immediate installation of explosion-proof equipment is not practicable at the present time, the inspector may suggest reducing the hazard by observance of the safeguards outlined in the code. The new code is available from NFPA in Boston at $3.

# Prepare for Wiring

### Loan agencies interested and future builders instructed

AWARENESS on the part of home financing agencies of the need for adequate wiring in homes that are to be built after the war, has been reported to be quite general from the interviews he has had with building and loan people, by Henry C. Rice, merchandise manager, Southern California Edison Co., Los Angeles. He found that they welcome any program that will assist in acquainting the public with the necessity for adequate wiring.

The interest of a building and loan agency is that a house on which it loans money will prove sufficiently satisfactory that the people will want to continue paying for it throughout its life. Such homes as are inadequate in any particular bring dissatisfaction which results in a large number of resales or reverts. Reselling of used houses that are inadequate is likewise difficult.

As a method of assisting to create a desire for adequate wiring facilities, the Southern California Edison Co. has taken two steps of significance in recent weeks. First is a pamphlet *Plans for Tomorrow* which was circulated to the company's entire list of customers along with its *Electrical Times* which, likewise, has been talking of wiring adequacy right along. The little four-page leaflet is well illustrated and is first of a series to be issued from time to time, giving ideas for planning the various parts of a home. Among the future issues will be those on kitchens, bathrooms, bedrooms, etc.

Second step taken has been to work with an experimental adult education class started at the Pomona city schools. An evening class has been started there by the adult education department. It is a series of lectures to cover everything from the foundation to the roof and designed to acquaint future home owners with the necessary things they should plan for in their dream homes. The electrical wiring story will be told in this series of lectures. Special plans are being made to make the electrical story an impressive one in order to create a lasting desire for wiring adequacy.

If this program works to advantage in the Pomona experiment similar classes are contemplated in other southern California cities. Other means to interest the home building financing agencies are also to be studied.

# No. 14—Obsolete

*J. A. Hill* *

Pacific Gas and Electric Co., San Francisco

THE following are my ideas in regard to postwar adequate house wiring:

1. An immediate postwar job will be the rewiring of thousands of houses built during the war. Temporary housing will be torn down, but permanent war housing is in need of more circuits and outlets. The FHA Title 6 houses originally carried 34 outlets, but were later reduced to 18 outlets per house. These homes should have not fewer than 45 outlets and one or two additional circuits to make them adequate. Surface wiring may be the answer to this problem.

2. No. 14 building wire is now obsolete for all house wiring and it should be removed from the market permanently. It is obsolete because:

a. It is too small for any circuit use, even for lighting, on account of the high wattages of lights and appliances which were being sold.

b. It certainly will be too small for any circuit wiring to accommodate the higher wattages of lamps and appliances which will be placed on the market after the war.

c. The electric inspectors in California are starting a movement to eliminate the requirements limiting the number of plugs per circuit where the type-S fuse or automatic breakers are used. If this Code change is adopted the 15-amp., No. 14 wire circuit will give us more trouble than ever.

d. Approximately 85% of the No. 14 wire, 15-amp. circuits now installed in homes are overfused from 25 to 100%. This is ample evidence that this size circuit does not supply the householders' demands.

e. The new pressure terminals on outlets, switches and other wiring devices which are now on the market eliminate the objection of the additional time necessary to connect No. 12 wire to terminal screws.

f. Stocks of No. 14 wire in the jobbing houses are now at a minimum and it is a propitious time to discontinue stocking No. 14 building wire.

The idea of removing No. 14 building wire from the market seems to have many advantages accruing to every branch of the electrical industry:

a. The wiring manufacturers have told me that it takes an extra draw to reduce copper to No. 14 size and then they sell it for less money than the larger sizes. They admit there has never been any reasonable profit in this size of wire.

b. The electrical wholesaler has been required to stock No. 14 wire in types R, RP, RW, RH, RU, and each one of them in seven colors to satisfy the color code in the National Electrical Code. The space taken up with the stocking of this one wire size seems to me out of proportion to the profit secured. Certainly No. 14 wire is one item on which price cutting occurs.

c. The electrical wholesaler who also sells electric appliances would secure a double barreled benefit because the elimination of No. 14 wire would give him more space to stock electrical appliances and would result in the sale of a larger volume of appliances.

d. At least 60% of the time, effort and grief of the electrical inspector revolves around the 15-amp. No. 14 wire circuit.

e. The appliance merchant would be glad to see the No. 14 wire circuit eliminated because it is the bottleneck to the sale of more appliances and higher wattage appliances. Voltage drop in the home is the major cause of unsatisfactory results from electrical appliances. Unsatisfactory performance brings costly service and returned merchandise expense.

f. The public utility would gain very materially from the elimination of No. 14 wire. It would eliminate a large number of service calls occasioned by blowing of fuses and other unsatisfactory operation of electrical appliances.

g. It is unnecessary to say that the home owner would gain more benefits from this move than any of the other parties involved. The purchasing public is desirous of buying and using all of the electrical appliances on sale, but it does not understand wiring problems and often misjudges the cause of troubles. Most of the complaints can be traced directly to undervoltage operation of the appliances due to lack of circuit capacity.

So far as I have gone every branch of the industry has reacted favorably to this idea and I do not anticipate too much trouble in selling the idea to the remainder of the industry. Of course I realize in order to accomplish it everyone must agree.

For the past five years we have all been trying to get electrical contractors to use No. 12 wire in place of No. 14, with very meager results. Competition of other contractors using No. 14 wire makes it impossible to expect a contractor to attempt this alone. The essence of this particular move is that of taking it away from them all and they will never miss it.

Let's sum up this problem this way. After the earthquake and fire of 1906 the City of San Francisco could have solved its traffic problem but it did not and it has not yet solved it. This is the only time during our lives that we have seen civilian business practically come to a stop. After the war we expect to start over again and this is a propitious time to eliminate our outstanding mistakes. I feel that the use of No. 14 wire for home wiring is one of these mistakes.

To continue with other steps that should be taken:

3. There should be a simplification and standardization of wiring methods. After careful study we should eliminate all these various wiring methods, except one or two. This will bring many economies in the stocking of materials, in specifying jobs, and will eliminate a large majority of the multiplicity of fixtures, fittings and devices now manufactured.

4. A uniformity of electrical ordinances will be of considerable benefit to the adequate wiring program. There is no good reason why a house on one side of the street should be wired differently from an identical house on the other side of the street, simply because a corporation limit runs down the center of the street. This is something which should be done *before* the end of the war. Electrical inspectors will not stop and teach their inspection forces the new ordinance when a great deal of building is going on. Building is now at a low ebb and it is an opportune time to promote the uniform electrical code.

5. We should standardize on automatic circuit breaker panels for all housing instead of the main switch and fuse panels. This is virtually an accomplished fact in the City of Fresno.

6. We should formulate a program to enlist the full cooperation of the electrical appliance sales group to help us sell adequate wiring. Adequate wiring is of great benefit to those selling electrical appliances. If they have never been told about adequate wiring, they cannot help us sell it.

7. Adequate wiring for prefabricated houses will have to be sold at the factory where the houses are built. Before prefabricated houses can be widely distributed over the country, it will be necessary to secure a uniformity of electrical ordinances. No prefabricated house factory can afford to equip houses differently for each different town.

* Presented to the Pacific Coast Electrical Assn. conference, San Francisco, Nov. 4, as the report of the Adequate Wiring Committee.

# What Every Dealer Wants to Know Is Told

**Concise answers to current questions given San Diego dealers at annual conference of bureau are those wanted by dealers everywhere**

AGAIN because the answers received and the discussion engaged in are such that dealers throughout the West will find their own conditions and problems reflected in them, the eleventh annual conference of the Bureau of Radio and Electrical Appliances of San Diego County is reported fully. Condensed only slightly from the summary made to members by J. Clark Chamberlain, manager of the bureau, this report represents the discussion at a meeting of nearly 175 dealers, distributors and utility men at an afternoon and evening gathering Nov. 4 at San Diego Woman's Club. The afternoon meeting was attended by over 100 men and the well-organized program got under way with a minimum of distraction. Paul DuPont, of Walker's Department Store, chairman, presided. Extracts from Chamberlain's report follow:

### Problems of Manpower

The War Production Board local manager and chairman of the Area Production Urgency Committee explained how the entire industry in a critical area such as San Diego is controlled by the urgency committee. Various industries are rated as to their priorities in obtaining manpower. He minced no words in stating that the primary war industries, such as aircraft and shipbuilding, rank well ahead of dealers and service shops. The recent restriction holds all companies to a maximum of their Oct. 1 employment levels. Those who can show real hardship in meeting this restriction may appeal in writing to the local War Manpower Commission.

*USES is Now Only Source of Needed Personnel.* The assistant director of the War Manpower Commission explained the order by which no employer, except aircraft virtually, may hire any male help between the ages of 18 and 60 unless the United States Employment Service specifically assigns them. This in effect, allows USES to send manpower to aircraft or shipyard plants or other high priority employers even if the applicant wants to work for the dealer. In short, to be able to hire any males of the restricted ages, except part-time workers, it will be necessary to do a selling job on USES to convince them of the dealer's need, assuming he is not exceeding his Oct. 1 maximum number of employees. (This applies to regions in which labor is frozen.)

*Selective Service Coordination.* The selective service coordinator for the district presented a more hopeful outlook. He assured that all repair personnel, including radio men, are considered essential and that refrigeration service men are on the critical list and cannot be drafted without formal opportunity for review of the case. He urged immediate action by all employers in filing 42-A and 42-B forms with the local boards for each vulnerable man. Individuals, such as service men working for themselves, may file as their own employer. It was his opinion that with the proper steps in filing, loss of essential men to selective service need not be feared.

### Parts and Supplies

The session on parts and supplies with a War Production Board man developed into a question forum. Dealers wanted to know why various supplies supposedly made available by WPB could not be bought from wholesalers. Logical answers were given by the wholesalers, practically all of whom responded. They were unable to get material from their sources, regardless of what the rules said. As a result WPB officials were reminded that the Office of Civilian Requirements was supposed to take care of this matter. A representative of OCR was to come to San Diego for hearings on Nov. 10 and 11 and a committee was organized to present the problems of the dealers to this representative at that time.

*Stove Rationing.* Stove rationing representative from OPA outlined the experience to date and pointed to a smoother operation. November quotas for the area were discussed and it was shown that increases had been granted because of the urgency in that territory. Dealers were urged to get their additional certificates at once and order stock before transportation difficulties became further congested.

### Postwar Margins

E. W. Meise, San Diego Gas & Electric Co., led a discussion on business practices, discounts, over-allowances, service beyond the guarantee period and margins. The assumption was made that margins may be reduced when selling is again resumed and he established the need for elimination of all practices which would make it difficult for a dealer's business to survive and make a profit.

A frank appraisal of the threat against private business represented by the cooperatives, of which there are several flourishing in the territory, and of the wave of "I can get it for you wholesale" activities which flourished before the war was made to show what lies ahead for retailers if their business practices are not streamlined to meet the situation.

Explanation of the so-called "Minnesota Plan" to curb unauthorized buying of appliances and other commodities by large business organizations for their employees, was made. This legislation is now in force in six states. Similar legislation hurriedly introduced at the California legislature reached the floor too late for action. This was analyzed and discussion was held as to desirability of its future resubmission.

A committee was authorized by the group to start work on this problem on behalf of the dealers in that area.

At the evening meeting, after a brief talk by Hance H. Cleland, president, San Diego Gas & Electric Co., and a summary of the subjects covered in the afternoon session, another pertinent subject was introduced.

### Guarantees

Elmer B. Hazie, chairman of the committee on guarantees and warranties, which has been working on the problem for several months, recommended that all action within the power of the dealers and distributors be taken to influence manufacturers to clean up misleading, confusing wording that usually appears on guarantees and warranties, for refrigerators particularly. Proof beyond argument was presented to show that, despite the care that is used by retailers in making a sale, the customer still thinks the "five-year warranty" on a refrigerator protects him against all eventualities. Two, three or more years after the sale, the dealer is frequently forced to absorb the cost of a trip and the service involved, simply because the us-

tomer refuses to pay or that to force collection would result in loss of goodwill.

That simple, readable language, telling the purchaser what the manufacturer does not guarantee, would solve much of the costly service dealers are now forced to absorb without remuneration was emphasized. The committee also recommended that 90-day guarantees by the manufacturer and in turn by the dealer should be sufficient on all appliances except possibly refrigerators.

### Term Selling Postwar

A former manager of CIT, now a vice-president of a bank and a member of the state committee on postwar term selling, Martin Frazier, gave a view of the credit problem following the war and its possible effects. In reviewing the term selling of the period prior to the influence of FHA and EHFA, he maintained that this influenced the "$5 down and $5 a month" philosophy so common before Regulation W was enacted.

He urged that all industries make every attempt to control their own selling policies and make unnecessary any permanent governmental control which otherwise would be inevitable. Installment buying will play an enormous part in creating postwar business, Frazier thought. Watching of credits will require more attention than before. He urged a middle ground, fair to buyer and to seller, as in the best interest of the industry and felt it could be worked out by the cooperation of all interested agencies.

### Novel Used Appliance Program

A new program to bring out unused small appliances, suspected to exist in considerable numbers, that they may be made available to war workers and others whose need is critical, was next presented by F. M. Raymond, bureau advertising adviser and advertising manager of the utility. Elmer Small, chairman of the bureau's advertising committee, presented him.

It was felt that refrigerators and washers will not be uncovered but that many irons, toasters, waffle irons, electric heaters and other items should be produced by the plan. This plan differs radically from others used in other parts of the country in that the appeal is based on giving and not selling the worn out or used appliance. Furthermore, instead of the dealer being the recipient and having to assume the cost of repairs when necessary, he acts only as a receiving depot. Thus his overtaxed repair facilities will not be further demoralized with an extra burden.

**An unselfish noncommercial offer to act as clearinghouse for used appliances is made in this ad for dealers**

The appeal is to be made to the public to turn in appliances to dealers, to be given without charge or compensation to Goodwill Industries, one of the oldest and best liked social service agencies of the community. This social service agency provides employment for aged and physically handicapped persons under the Community Chest fund and its shops will repair and its stores dispose of the equipment turned in.

The program calls for generous advertising in local and county papers, cards in streetcars and buses, radio announcements over three local stations and window cards for dealers to identify them with the program. Mechanics of the plan call for bringing the unused appliance to the dealer's store where a receipt will be given and a tag with the type of appliance, make, the donor's name and address tied to it. On call Goodwill Industries picks up the accumulated items and when received and classified sends a thank you card to the contributor. The program was scheduled to begin about Nov. 18 with publicity to break Nov. 22 and was to carry through November and December.

This interesting conference closed with a short talk of congratulation to the dealers by A. E. Holloway, vice-president of the utility, who had been instrumental in the formation of the bureau. A short talk was also heard from the manager of FHA and, in conclusion, Chamberlain gave a report of the secretary-manager for the bureau.

Even the pattern for this meeting suggests to other regions the value that can be derived from a well-organized, compact, practical afternoon and evening conference of this type.

# Localize Radio

## Lewiston WWP puts Reddy Kilowatt Quiz on the air

AN effort to make local radio programs compete with national entertainment has been undertaken in the Lewiston division of the Washington Water Power Co. The program, tied to community and war activities, makes a strong bid for local participation.

*Reddy Kilowatt's Evening Question* is the name of the program. After the title is announced, the listening audience is reminded that one question of civic or community interest will be asked, and to the person first telephoning in the correct answer, a War Saving Stamp will be awarded and, as additional incentive, that person is invited to send a complimentary carton of cigarettes to some member of the armed services. Enclosed in the package is a printed greeting card bearing the company's name together with name and address of the complimentary donor.

Questions cover a wide field such as: Who is the president of the local Chamber of Commerce? What is displayed in X-Merchant's store window? How many children are enrolled in the city's public schools?, etc.

While waiting for correct answers to come in, the announcer sketches interesting facts about the service man nominated to receive the carton of cigarettes, his birthplace, schooling, vocation and present whereabouts. The announcer also presents background data regarding the question of the day. If it pertains to the city fire department, the announcer tells something about the department's origin, personnel and policies. Naturally the department is informed that it will receive radio publicity that evening and its personnel is sure to tune in. Though the program lasts for only five minutes, the sponsor is not forgotten. A brief word about rates, service, etc., is not objectionable.

● GAS COMPANIES are being organized by planning-minded Louis Ruthenberg, president of Servel, to take on distribution of his all-year gas air conditioning package unit. Meetings were held in San Francisco and Los Angeles to initiate the pre-training as part of Servel's Committee for Economic Development program for re-employment.

# Where To?

## Quick glances at the indicators for tomorrow

YEASTY stuff is this planning for the future. Everybody's doing it. There is similarity in what is doing, and yet difference. After the statistical number in February 1944, thorough surveys of some of these fields of planning will be made by this magazine. Meanwhile here are some of the trail markers.

● *Electric appliances seem preferred* if the sampling of opinion made recently by Fact Finders Associates, Inc., in nine cities is a clue. In interviews with 819 workers, half women, half of them men, 628 plant people and 191 white collar, 254 of them want an automobile, 213 a refrigerator, 197 an electric washer, 173 a radio, 157 a vacuum cleaner, 107 a gas stove, 90 a toaster and 76 an electric range (a higher percentage than in any previous polls). Women wanted the washer, men the automobile. Men's second choice was the refrigerator, while it was third for the women. Of the 819, those who want to build a home numbered 172, or 21%.

● *Hotpoint has started its postwar program* already with the retaining of Charles Low, a merchandising specialist, to prepare a series of bulletins on after-war merchandising. These are to be sent to dealers on request. To launch the program George H. Smith, general sales manager of Hotpoint, is making a tour of the country. He was to be in Salt Lake City, Nov. 23, Seattle Nov. 29, San Francisco Dec. 2 and Los Angeles Dec. 6. Hotpoint is directing its program toward aiding the independent electrical appliance dealers to meet the postwar competition of chains and mass outlets by bringing better training to the sales staffs of its dealers.

● *Three trends of significance* were predicted by Dr. Baldwin M. Woods, eminent engineer and department head at University of California. These are (1) more automatic features to all equipment, (2) an employment transition in which fewer will be engaged in manufacturing operations and more in service and distribution, and (3) a scattering of people away from congested cities to suburban settlements as industries move out of towns into the country. This, to electrical dealers, means more stores in these suburban communities.

● *Irons*, according to talk from Washington, are to be made again in limited quantity, but it isn't official yet. Allocation of materials is hardly likely before the second quarter of 1944. A big program to get burnt out old irons into use again by repairs will be launched at the same time. Washers and refrigerators may come later in 1944. Steel is available, but motors are not.

● *What can and what cannot be claimed* for ultraviolet lamps is pretty well defined in reverse in the stipulation of the Federal Trade Commission to the Science Laboratories, Inc. and Sperti Electric Co., Inc. to cease and desist claims of this kind: "that conditions of the modern age are such that we are deprived of most of the benefits of sunlight, or by inference that it is essential for health to obtain such radiation by artificial means; that the low death rate in summer as compared with the high death rate in winter is an index to the deficiency of ultraviolet light in wintertime; that the lamps are indispensable for expectant or nursing mothers; that exposure to ultraviolet radiation is the only way to obtain vitamin D or that vitamin D helps build up the general system unless it be clearly specified that an intake of vitamin D is beneficial in cases only of vitamin D deficiency; that the lamps are an aid to skin health or to a clear, unblemished complexion in general, or that infrared emanations from the lamps relieve aches and pains other than those of minor nature, or that such irradiation relieves all types of pains and aches or constitutes a competent treatment or an effective remedy for all types and conditions of soreness and congestion. Respondents further agree to cease disseminating any advertisement which fails to reveal that the lamp should not be used in cases of pellagra, lupus erythematous, or certain types of eczema, provided, however, that such advertisement need contain only the statement, 'Caution: Use as directed' if and when the directions for use contain a warning to the above effect." Such a proscription leaves very little sales talk for anybody's sun lamp. Imagine a salesman saying, "We believe these lamps are good for you, but we dare not say so. You really will have to find out for yourself."

### Newcomb States Opinions

● *Clues to the future* were also to be found in the answers of T. J. Newcomb, sales manager for Westinghouse Electric Appliance Division, of Mansfield, Ohio, to questions put to him in press conferences while he and H. B. Donley, appliance sales manager, Westinghouse Electric Supply Co., of New York, made a tour of the West. Newcomb stopped at San Diego, Los Angeles, Reno, San Francisco, Portland and Seattle, and Donley continued at Spokane, Butte and Salt Lake City.

● *Packaged kitchens* for prefabricated houses were a possibility, answered Newcomb, but such packaged jobs could not take advantage of the improvements constantly being made in appliances so well as those houses with individual appliances. He looks more for an evolution than revolution in this regard.

● *Dream stuff* will not begin to pour out of the factories the minute shooting stops. It will take six months to a year to put 1941 models back into production for emergency needs with existing dies and tools. It may be five years after the war before some of the war-developed products and ideas and methods can be adapted to civilian wares. The bugs must be worked out of any new development, manufacturers with a hard won quality reputation feel, before it is marketed. True the war has meant great development. In a war you can afford to try many new things which you couldn't afford in peace. New materials, said Newcomb, must prove to be as good as or better than existing materials, and be available at a cost the equal of or less. before they will be used to replace tried and proved materials.

● *Plastics are an example.* They are used extensively for trim and for parts whose properties are within the known strength of the materials. While true that plastics have high efficiency as an insulation, the question of structural strength will have to be satisfied before they can be used for refrigerator cabinets.

● *High frequency cooking* is another of these long range hopes. A lot of work is being done by every electrical manufacturer in an experimental way. But the immediate improvements to be expected are more time and temperature control improvements in ranges.

● *Automatic washers* are definitely on the promise list soon. There are already large numbers in use. The whole problem of laundering is receiving a new approach, Newcomb said, and washing, rinsing and drying can be done "without having to wear hip boots." Improvements in ironing are being sought. The answer to the dishwashing problem is still to be found.

● *Frozen foods* will be so important after the war, Newcomb feels, that even if every home does not do its own freezing, and many will, more

storage for frozen foods from the markets will be wanted. He foresees a trend toward larger refrigerators with more frozen storage capacity.

● *How long before appliances are available?* Newcomb said we had two wars on our hands. If the first—the European—is ended soon, we'll be half in, half out, and perhaps some materials and manpower can be returned to appliance production. The government knows the critical need for some of these appliances for preservation of health and welfare of the nation. As soon as possible there will be authorization for making some. If so, the character and quantity will depend on available tools and material. It will take some time to satisfy the pent-up demand.

● *Speaking of washers*, General Electric Co. has adapted its washer to help hospitals administer the Sister Kenny treatment for infantile paralysis. It provides an improved way both to heat and wring the heavy woolen cloths or packs that are wrapped around the patient to relieve pain and reduce muscular spasms. Old methods employed heating over inadequate stoves, wringing through a hand wringer. The special washer has no agitator. An immersed Calrod element boils the water and thus sterilizes the packs. To protect nurses from burns the tub is jacketed with glass wool. The top has been redesigned to allow steam to escape. The wringer runs faster and pressure is increased to 700 lb. and wrings so dry that even at 180° F. they may be applied without burns to the skin. Rolled into the ward the machine permits on-the-spot preparation of the packs.

● *Surveys are being made* by many companies these days to help with postwar appliance design. General Electric Co. sent a radio questionnaire to its 227,000 stockholders asking opinions and preferences in cabinet style, other details. A range questionnaire was sent to 25,000 families asking questions about what kind of a range was wanted.

● *Financing*, not only of appliances but of other products of its parent company, is the purpose of a newly formed General Electric Credit Corp., which will take over and broaden the scope of business carried on since 1933 by General Electric Contracts Corp. The immediate job will be financing of war construction and production work involving use of the company's products. After the war it will finance appliances and other consumer goods.

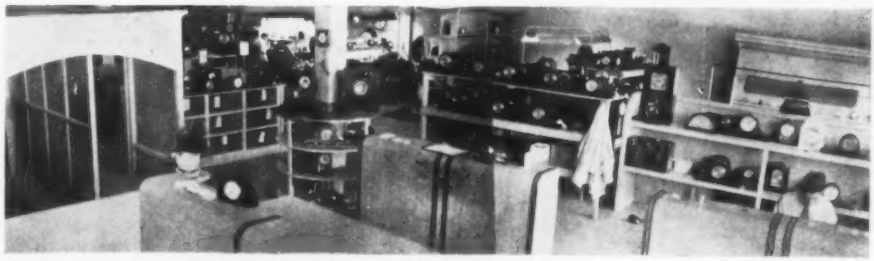
● *Spring Market* will be held as usual, Feb. 7-12, at the Western Merchandise Mart, San Francisco, says Frank K. Runyan, vice-president. Keyed to wartime conditions in every sense of the word, he says, it is designed to serve the basic needs of Western retailers and offer them every possible aid in extending essential service to customers. There will be some merchandise available.

● *Down to two dealers* in all Orange County, and these two handling only refrigerator and washer repairs, The Southern California Edison Co. has set up a repair service for small appliances at its offices in that county. Customers complained that they had no one to take appliances to and that, if shipped to factory branches for repairs, were long delayed in getting them back. The utility felt it to be its obligation, said H. C. Rice, merchandise manager, to set up a temporary service until dealers again can handle the job. The utility has manpower, but parts are difficult to get. A flat price of $1 plus cost of materials is charged, no matter if only an adjustment is made. In many cases the labor cost exceeds this charge. The customer brings the appliance to the utility office and picks it up when finished. No fancy shop or counter is provided, just some vacant space somewhere in the building is used. A postcard was sent to all customers in the district notifying them of this service. To date there are more appliances than the limited crew can handle.

● *A racket has developed* in Los Angeles, the *Wall Street Journal* states. Householders advertise used appliances for sale. The racketeer calls and offers a price above ceiling without asking what the owner asks for it. He buys, gets a receipt, then a few days later calls back saying that he has looked up the ceiling price and demands three times the excess over the ceiling price as damages. The OPA regulation is being used to muscle the racket.

# New Time Shop

Outgrowing the original clock repair shop started only three years ago, and its annex of the next door store, California Electric Service Stations in Los Angeles moved not long ago to much larger quarters at 1518 West Seventh. Keith L. Chamblin, district manager, had started alone, now has 15 employees on clock repairs alone. Arrangement of benches, racks, parts stock, receiving and shipping were all worked out from plans made in advance derived from experience in operation. Top picture shows the exterior frontage on Seventh Street with the shop's truck for pickup from other dealers throughout southern California. Next two pictures show a spring clock repair bench and typical electric repair benches. Below is a panorama of the office, service counter and portion of the shop. Bins were made from cartridge boxes for parts storage. Shipping department is at rear with alley entrance. There is room for growth now



# Diet Clinic Helps

## Activity another means of boosting employee morale

SPECIAL activities designed to maintain employee morale in wartime should include a woman's diet clinic, according to J. E. E. Royer, vice-president and general manager of the Washington Water Power Co., Spokane, who states that management has encouraged the activity and results are already gratifying.

Actually the clinic follows upon the pattern of the well-known Health for Victory program, outlined and sponsored by the Westinghouse company. Once each month, at close of the day, the company girls meet in the Spokane auditorium where luncheon is served. Preparatory arrangements for the luncheon are made by a small committee appointed each month, and tastes run to coffee, sandwiches, an occasional hot dish and dessert. At six o'clock the girls are in their places ready to hear discussed wartime diet and menu problems and watch the demonstration.

While the company has 135 women employees, 97 are registered for the clinic and an average attendance of 67 is the record to date. Home Service Director Lucile Ramirez exploits topics of interest to the girls such as meat substitutes, milk and bread. The right way and the wrong way to prepare vegetables, etc., are demonstrated on the electric range and new employees quickly absorb the general idea that in wartime electricity plays an undiminished part in the preparation of meals.

Throughout the informal demonstration, questions may be asked—a sure test of interest. The girls are not backward and queries indicate two things: First, that they have a genuine interest in learning about wartime food preparation, and second, that when the war ends, a deep-rooted attachment for the home will not leave our kitchens to the management of the men.

After the demonstration, which usually lasts for an hour and a half, a drawing takes place and lucky attendants take home food prepared during the demonstration. Post-clinic interviews the other day brought forth such comments as follows:

"Substitutes always were a problem. Until we had these classes, I used to eat downtown nearly all the time." "I never did like carrots, but when one knows how to cook them, they are delicious." "What I like about the classes, is it brings us all together. There is little going on, and we feel that the company is still alive and that we have something in common." "I guess some of us attend because we know that management is interested in what we are doing."

● *A "U Plan for V Day"* is being distributed to dealers by Universal's Landers, Frary & Clark Co. A kit is provided with advertising material to tie in with national advertising. A bond holder is furnished to customers in which to place bonds for security and education, purchase and maintenance of home or farm, purchase of Universal household equipment and miscellaneous other purchases.

● *Philco Corp.* has just announced a service manual covering its refrigerator. All the service information previously issued has been combined in one manual for dealers and distributors.

● *Saviers, in Reno,* joined the War Bond drive with large scale advertisements in local papers, recently. The size of the space by this dealer-distributor was unusual.

Kimball Vance, left, proprietor of Vance Electric Service, Salt Lake City, has moved to a modern, well equipped building at 1063 South State St. and plans to handle appliances after the war. Now his work is mostly contracting. In the picture with Vance are Mrs. W. Swenson, and L. A. Lee, of Vance Electric staff

# Few Priority Changes

● RELEASE of critical materials for necessary repairs to homes and commercial buildings is provided in a new CMP Regulation 9A, Nov. 26. It also releases copper wire for repairs.

● L-41 which limits construction, was redrafted and issued in simplified form, Nov. 1. The language is cleared up, the limitations made clearer. Some changes are made in the limits for different types of construction. The overall limit on construction was reduced from $1,000 to $200 without specific authorization. Certain exceptions are made. Consultation with WPB is to be advised before undertaking any construction for clearance.

● AN UPPER LIMIT of $5,000 has now been permitted for extensions to consumer premises which may be constructed without specific authorization by the utility under a new order U-1-h, issued Nov. 1. Details of this order should be studied for precise application.

● PURCHASE of new electric meters from manufacturers stocks was prohibited Nov. 16, by amendment to L-151. Severe drains on manufacturers stocks necessitated it. Restrictions on manufacture of conversion parts to enable repair and conversion of existing meters were eased. Meter making stopped July 1942. Permission to buy from existing stocks must show necessity for war housing or replacement of meters beyond repair. Form WPB-1319 is used.

● COPPER WIRE was restricted under directives from WPB prohibiting shipping multi-conductor, rubber jacketed cords or cables for shipment on warehouse replacement orders or MRO orders. Copper mills were also directed to reject orders bearing V-3 of less than 300 lb.

● INDUSTRY ADVISORY COMMITTEE meetings during the past month considered: material situation to produce electric fuses; fractional horsepower motors for possible appliance manufacture and for farm equipment; carbon brush standardization and simplification and codification; conduit and metallic tubing requirements for 1944.

● FIVE WEST COAST cities were placed on the area production urgency list—San Diego, Los Angeles, San Francisco, Portland, and Seattle. Stricter freezing of everyone to his or her job also went into effect in many cities or regions, limiting total personnel to that which any company had on Oct. 1.

# PCEA Takes Stock at War Conferences

"STRONG industry as well as strong individuals seek opportunity, not security alone. The electrical industry has been strong, let's keep it that way. The things we have done won't destroy us, but the things not done might."

In these words President Frank C. Angle, Pacific coast manager, Allis-Chalmers Mfg. Co., expressed the theme of two wartime conferences of the Pacific Coast Electrical Assn. held at Los Angeles, Oct. 27, and in San Francisco, Nov. 4. Compressed into one intensive day, the noon luncheon was the only general session, with the three sections holding conferences in parallel. Questions of retaining wartime practices and shortcuts after the war and power pool operating characteristics occupied the Operating Economics Section. Personnel and complex regulation problems concerned the Administrative Services Section. The Business Development Section surveyed ahead to the time when business can be developed again taking sights on the shape of domestic, farm, industrial and lighting markets.

Because employee training is a necessity for all groups, the noon luncheon program in both cities was given over to representatives of the California State Department of Education, E. Kinnett in Los Angeles, and Hughes M. Blowers in San Francisco, both from the distributive education departments of the commission for vocational education, and both showing the Training Within Industry technique for instruction. In each case, the instructor, with the help of volunteers from the head table, acted out the three ways by which education can be imparted—verbally, by demonstration, and by a combination of the two with some psychology thrown in to make it take. A simple example, tying an underwriters knot, was used to illustrate the methods and show their relative effectiveness.

## Operating Economics

*E. A. Crellin, chairman*
*Pacific Gas and Electric Co.*
*San Francisco*

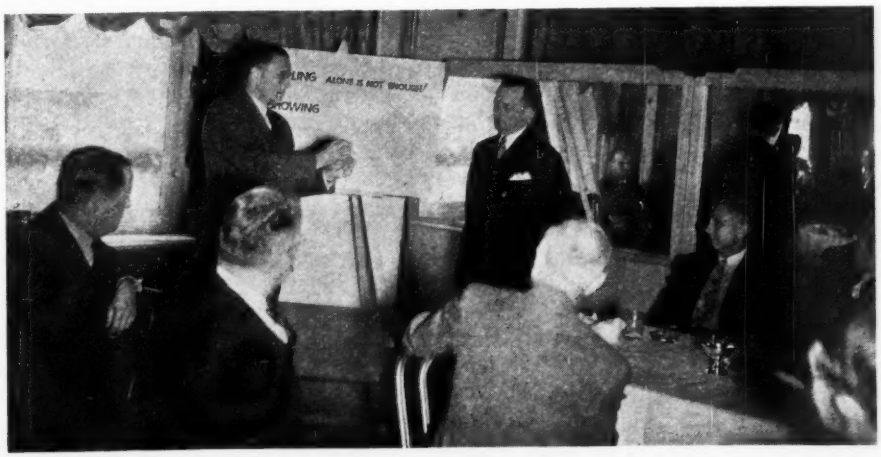
*E. W. Morris, vice-chairman*
*Westinghouse Electric & Mfg. Co.*
*Los Angeles*

A FEATURE entirely new to technical conferences of the PCEA and one that scored an outstanding success and met with universal approbation, was a round-table conference or panel discussion with George C. Tenney, editor of ELECTRICAL WEST, as moderator and a panel of eight representative industry men who gave their answers and expert opinions on a number of live wartime topics. This feature of the program was handled by Tenney much in the same manner as several national radio programs, with a microphone for each speaker.

Sharing interest at each meeting with the round-table discussions, reported elsewhere in this issue (p. 49), was a symposium of three papers on operation of the Pacific Southwest Power Interchange. These papers, one on prime mover governing, one on telemetering and a third on tie-line load control, were presented in full in ELECTRICAL WEST for November 1943, p. 52.

N. B. Hinson, So. Calif. Ed., in opening this part of the program gave a brief history of the formation of the pool and said that its operation had been so successful in utilizing existing generating capacity to fullest capabilities and thus obviating contemplated new generating capacity that it is likely pool operation will be continued after the war. Total capacity of the pool is now 4,450,000 kw. with estimated 1943 generation of 19 million kilowatt-hours and interchanges between the nine participating systems ranging from a few thousand kilowatts to more than 200,000 kw. between two of the systems.

*Electronics at Work*, a sound moving picture by Westinghouse, was



Above: Experts on San Francisco panel left to right: J. P. Jollyman, Charles Grunsky, William P. L'Hommedieu, I. W. Borda, Moderator George C. Tenney, George E. Kimball, Walter C. Smith, S. J. Lisberger, R. A. Wehe

Right: Hughes M. Blowers, California State Department of Education, demonstrates employee training techniques

A. G. Cage

shown to the section in Los Angeles, preceded by a talk by E. W. Morris, and to a joint session of Operating Economics and Business Development sections, in San Francisco, A. W. Copley, giving the introduction. W. P. Bear, PG and E, followed with a summary of electronic applications in use today in the fields of lighting, industry and commerce, hinting at some in use by the armed forces which are still secret, and predicting possible future uses when such equipment is again available to the civil population.

*The Application of Visual Education to the Training of Personnel, both in Safety Matters and in Vocational Effort,* was presented at the Los Angeles meeting by Howard Jandt, Allis-Chalmers, Los Angeles, and by A. W. Uhrich, San Joaquin Division, PG and E, Fresno. Jandt was assisted by Howard Miller and C. A. Fischback, So. Cal. Ed., Long Beach and Bell, respectively. In each case the use of slides, sound slide films, silent and talking pictures was discussed, and typical educational uses of these media for education were shown as examples. For example, a film strip made by Willard Battery Co. to show maintenance and repair and a silent film by General Electric to illustrate electric range repair were shown at the San Francisco meeting.

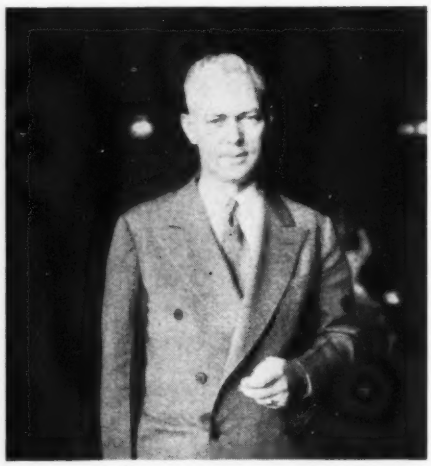
The transportation group, transferred to the Operating Economics Section, held a morning meeting at Los Angeles, presided over by P. H. Ducker, So. Cal. Ed. Office of Defense Transportation, Interstate Commerce Commission, California Highway Commission and other regulations, as well as labor and technical and maintenance problems, were reviewed and ideas and methods exchanged. Operating a fleet of cars and trucks is no longer a mere mechanical matter. Conflicting laws and regulations, plus restrictions on fuel, tires and repair parts, make necessary the adjustment to legal, personnel, military and other new complexities hitherto unknown to such transportation men.

## Business Development

*P. P. Pine, chairman*
*San Diego Gas & Electric Co.*
*San Diego*

*Milo Cain, vice-chairman*
*Coast Counties Gas & Electric Co.*
*Santa Cruz*

A WARTIME blackout of electrical appliances and handcuffs on agricultural, industrial and lighting business development did not prevent the erstwhile commercial men, now turned service and utilization specialists, from looking ahead to better days and planning to make them so. Some of the obstacles and evils of the past were looked over with an eye to eliminating



P. G. Savage

them, if possible, from the future. Both conferences had the same list of topics. Yet because different speakers handled them, reflecting varying points of view and local conditions, approaches and reactions were not the same in both conferences. Nowhere was this more apparent than in the unresolved struggle for water heater standardization.

*Water Heater Standardization*—H. C. Rice, So. Cal. Ed., had I. H. Lecklider, of his company, present an analysis of loads and system peaks, indicating that an ideal load would be one just the reverse curve of the system curve. Water heating, the conclusion was drawn, would best do as an 18-hour load, off from 2 to 8 pm., with sufficient storage to tide the dinner hour drawoff. Standardization for his company, would mean meeting such conditions.

On the other hand, Bert Reynolds, PG and E, told that his company's rates for water heating have never been complicated by off-peak provisions and high-wattage, single-element heaters have given its customers satisfactory service. He reviewed the eight standards suggested by both EEI and NEMA, concurring with all but that of wattage ratio to size of tank. To him the ratios suggested would bring down the level of service a customer expects from a water heater. Effect on the peak had never been considered serious by his company, even in districts of high range and water heater saturation.

An interesting point was made by Reynolds. If the automatic washing machine is to be expected, greater demands for hot water are to be expected also and none of the tank capacities and wattages contemplated will be able to supply it. The answer, he admitted, might be that with an automatic washer in a home the washing would be done oftener in smaller batches and hence not tax the water heater. The 3-kw. 30-gal. type of heater sold generally on PG and E lines, Reynolds said, only adds 588 watts to the system peak at the most. The rate is simple, the customer gets 24-hour service. Smaller tanks take less materials and require no extra metering. If tank sizes can be standardized, as well as openings and threads and wiring, elements can be inserted at point of use to suit various utilities, he felt, and a great deal could be saved in cost.

*Domestic Appliances*—More unanimity characterized the domestic appliance sessions, sponsored in Los Angeles by M. G. Sues, Leo J. Meyberg Co., and San Francisco, Clyde Allen, Graybar. Term payment policies to be expected after the war were discussed by Ben Davis, in the southern, and H. H. Garfinkel, northern meeting, both from G-E Contracts Corp. Despite large holdings of War Bonds, both said, time financing of appliances will

E. W. Morris

be used extensively after the war. That 75% of Christmas savings funds stay in savings, and War Bonds are being regarded as savings; that the government will discourage liquidation of War Bonds at too fast a rate; that returned soldiers and many white collar groups unable to buy bonds will have to buy on terms; that appliance production will be greater than normal ability to absorb and will need credit selling to distribute were reasons given for term accounts after the war. Both urged better control of term offerings, sounder financing, or government again might seek to regulate or even enter financing. Competition between appliances, furniture and automobiles will be very intense. Financing of appliances built into new houses along with the mortgage is likely, too. To be expected, too, are "floor plan" financing of new dealers by manufacturers, especially to returned soldier dealers without finances.

*Reasonable Guarantees*—Two different viewpoints were expressed in respect to reasonable guarantee periods and service promises. In Los Angeles, W. E. Cranston, Jr., Thermador, expressed the manufacturers' side; in San Francisco, F. U. Naylor, PG and E, that of the utility and dealer.

Cranston pleaded for an honest sales story in respect to manufacturer's guarantees, and told of responsibilities that should be assumed by the utility and the water company, where corrosive conditions exist. Switches cannot be guaranteed, he said. Customers need proper instruction.

Naylor, speaking from the dealer back to manufacturer, called for clearer intent expressed on guarantees, better appreciation given dealers as to service limitations and responsibility for parts not made by the appliance maker. He indicted the "orphans" left without support by manufacturers who quit, and pointed to the need for better selection of reliable sources. The problem, he said, is dual—first on new appliances, second as to parts and replacements. Product engineers, he declared, would do well to have more meetings with service men so that they could design parts that stand up.

The cure, Naylor felt, is not in guarantees, but to make better quality appliances. Automobiles long ago gave up longer than 90-day guarantees and major appliances should do likewise.

*Refrigerator Dimensions* — E. N. Frellson, G-E Supply, spoke to the Los Angeles meeting about standardization of over-all dimensions of domestic refrigerators. Since most manufacturers have cabinets of practically the same dimensions the difficulty seemed to sift

Fred Garrison W. H. Talbot

to one of getting architects and builders to allow more space for larger refrigerators since the 8-cu. ft. style is most efficient for family use.

Harold Conklin, Hotpoint, Los Angeles, discussed WPB regulations affecting sales or releases from frozen stock, at the southern meeting. A wire from WPB was read assuring permission to manufacture electric irons in limited quantity next year if manpower and materials can be spared.

*Postwar Appliance Distribution Channels and Costs* — Miss Clotilde Grunsky, Pacific Coast editor, *Electrical Merchandising*, addressed both meetings, bringing her own and the observations and opinions of Lester Moffatt, editor of *Electrical Merchandising*, on trends to be expected following the war. Forecast is a market in the five years after the war of 62% replacement of refrigerators, 59% washers, and 70% ranges. The West's increased population is likely to stay and even be supplemented by returning soldiers. This will attract many to start in business. Requests for market information hint of many new appliance makers. New makers will seek outlets and compete with old established manufacturers for existing dealers. Many manufacturers plan full lines of products.

J. F. O'Donnell E. W. Isenhower

Too much competition and a glutted market may result. Chain stores can be expected to be more active. *Fortune's* survey showed Sears sold 11.2% of all refrigerators in 1937, 20% in 1939. In Los Angeles they may even have sold one in three of all refrigerators. They can be expected to be aggressive merchandisers of all accepted, proved appliances. But specialty selling will still be needed on new devices, automatic washers, air conditioners, cold storage freezers and television.

Other competitive rivals may be the prefabricated house builder, the home builder. There are 10 or 12 on the Coast who plan houses fully equipped, postwar.

Severe competition may mean a relatively low-price level and dealers and distributors required to bear their share of cost reduction in lower margins. Service may have to bear its own expense and make a profit. The postwar prospect for electrical appliances, she concluded, is for a tremendous market but plentiful competition and will require highly efficient merchandising for success.

*Adequate Wiring*—The most novel and forthright attack upon the home wiring problem in many a day was made at the San Francisco meeting by J. A. Hill, PG and E, with the proposal that No. 14 wire be removed from the market as obsolete. Full text of his report is on p. 61.

At Los Angeles, H. C. Rice, So. Cal. Ed., told of efforts to be made to get architects to make wiring plans of houses so that future additions to wiring may be made. He spoke of circuit possibilities where non-tamperable fuses are used. Likewise he talked of new materials and their possible application. He ended by describing the classes being held in Pomona to teach future home owners, as a method of acquainting the public with the wiring need.

*The Code and Ordinance* committee report in Los Angeles, given by Frank Watkins, So. Cal. Ed., and by Ben Hill, Superintendent of the Electrical Division, Oakland, at the northern meeting, told that 24 cities had adopted the unsafe electrical appliance ordinance and 61 more have it under consideration, and 16 cities had previous ordinances along the same line. The League of California Cities has endorsed it and given it strong support.

*Farm Electrification* — For a peep into the future of farming as a source of industrial raw materials, representatives of the Western Regional Re-

search Laboratory of the U. S. Dept. of Agriculture, at Albany addressed both meetings—Dr. E. A. Beavens in Los Angeles, and Ray H. Nagel for Dr. T. L. Swensen, in San Francisco. Sponsors were D. B. Wheelock, California Electric Corp., and Thor Christensen, PG and E. Telling of research in foods and materials now to aid the war effort, these men predicted postwar applications of them which would be valuable. Interesting to the electrical industry was a predicted increase in frozen food lockers, both commercial and domestic. Frozen precooked foods, too, were predicted. Dehydrated foods, however, they said, would serve only such purposes as the war has required, reduced bulk to save shipping space and weight.

*Lighting*—While R. C. McFadden, So. Cal. Ed., told of the organization being perfected to "Light up for Victory", at the Los Angeles meeting, Proclamation 20 of the Western Defense Command, issued the next day, brought lighting of signs back long before victory and Gilbert Trosper, PG and E, who was to talk on the same subject in San Francisco, briefed his remarks to a reading of the proclamation and a suggestion that a real celebration be organized when the war does end in each theater.

Walter Carlson, G-E Lamp Dept., sponsor of the industrial lighting session, in the north, called upon Joseph Gumz, PG and E, recently returned from Washington, to tell what the power conservation order from WPB, ODT and the fuel administrations would require for compliance. He detailed the six steps to be taken to solicit public cooperation. Gumz talked frankly of the fuel oil situation and showed the necessity to conserve it even in a territory served largely by hydro.

George Rankin, So. Cal. Ed., sponsor of lighting discussion in Los Angeles, cut out his own topic because of time. Leonard Hobbs, Smoot-Holman Co., discussed the effect of WPB restrictions on equipment and its performance. Reduced efficiency and safety, less total illumination than required for best results, makeshifts and haywire expedients all make a condition which is a bad example for future lighting practice, Hobbs declared, unless a sales educational job is undertaken in the postwar marketing era.

The new 3,000-watt high intensity mercury lamps used for the first time recently in southern California war plants gave H. J. Channon, G-E Lamp Dept., Los Angeles, an opportunity to describe the experience and results

Milo Cane Walter Carlson

with them. They are mounted 90 ft. high, in two rows, nine to a row in one area; 76 ft. high, one for each 1,600 sq. ft. in another, producing 58 f-c initially, 35 depreciated.

Wartime applications today, said S. H. Hazelton, Jr., G-E Lamp Dept., at the northern meeting, indicate new applications for lighting postwar. Trends toward higher wattages are indicated, for example. No new lines are being developed now, but within six months after war's end new lamps may come. Some of the eliminated sizes—50- and 75-watt sizes—may not come back. Sealed beam lamps will expand. There may be more bowl and neck silvering. Fluorescent lamps may come in circular shapes; also higher wattages. There will be starterless starting. Cold cathode lighting, he predicted, may be used in as much as 30% of the new applications. The fixture market will be large, to satisfy a pent-up demand for more illumination. He enumerated many markets for relighting and for special lamp applications, such as germicidal lamps. With higher efficiency light sources he urged that better trained technical personnel guide the course of future sales.

Speaking briefly and pointedly of cold cathode lighting, W. P. Bear, PG and E, asked manufacturers of such equipment to establish standards as to

H. A. Lee E. A. Long

gas mixture, vapor pressure, color of glass, size of tubing, make and purpose, and to establish test facilities to determine lumen output, surface brightness, output efficiency, coefficient of utilization, tube life, lumen-hour values per dollar. Without such facts and standards "how can we recommend it for general illumination?"

*Industrial Electrification*—Different, too, were the sessions on industrial power in both meetings. Limited for time, the northern meeting heard only a description of the electrical equipment at Permanente magnesium plant, by Alex Locey, electrical engineer. He also touched on possible postwar uses for magnesium now being studied by the research laboratories of the company. E. E. Peterson, PG and E, was sponsor when F. H. Searight, Allis-Chalmers, could not be present.

In the southern meeting, under G. N. Hawley, So. Cal. Ed., as sponsor, and G. R. Best, G-E Co., as discussion leader, the program was conducted as an industrial survey. August Slater, industrial engineer, Los Angeles Chamber of Commerce, reviewed the industrial trends in the region. He covered personnel, employment, purchasing power, manufacturing capacity and broke it down into electrical consumption per man. The type of industry such as lumbering, in other regions, calls for more electricity per man, but in total volume the southern California market was larger. He estimated that the 11 Western states now manufacture 1.7% of the national total of electrical machinery, 2.9% of the appliances, 1.5% of radio and 2.6% of refrigerators. With 10% of the population, the West has 15% of the nation's purchasing power. He estimated 13% market increase in Los Angeles.

R. K. Collins, Westinghouse, ran through the field of trends in industrial electrification, including radio-frequency heating, electronic devices, controls, air cleaners, welding—especially automatically controlled and in gas atmosphere.

H. R. Haines, So. Cal. Ed., summed up by discussing steps that should be taken now to prepare to capitalize on these trends. He discussed competition, manpower, sales engineering organization, paperwork connected with it. The information now received from the manufacturers of equipment, he said, is not sufficiently complete. The utility power consultant enjoys the confidence of customers as never before because of the job done during the war. Manufacturers should fill them with the factual data they should know to advise consumers in the conversion of plant to new processes.

# Administrative

*F. C. McLaughlin, chairman*
*Southern California Edison Co.*
*Los Angeles*

*H. A. Lee, vice-chairman*
*Pacific Gas and Electric Co.*
*Stockton*

WITH Pearl Harbor almost two years behind them, utility executives and supervisors have little to learn about the complexities of wartime operation. The topic, however, is still a live one—the tightened manpower situation, rapidly changing regulations, increased paper work see to that—and in round-table debate, members of the Administrative Services Section thrashed out old and new problems, shared experience gained since the June sessions.

Identical or related subjects were discussed at Los Angeles and San Francisco in parallel sessions devoted to (1) Accounting, R. N. Dreiman, Coast Counties G & E, sponsor; (2) Credits and collections, personnel and customer relations, H. V. Busby, So. Cal. Ed., sponsor, E. A. Long, PG and E, co-sponsor; (3) Materials and equipment, W. J. Lainson, San Diego G & E, sponsor, C. W. Goodwin, Jr., G-E Supply, San Francisco chairman.

### Customer Relations

Manpower shortages both in the home and in industry are bringing much the same problems to all utility customer relations men but solutions for the most part must be tailor made to fit the locality and individual case. This was the inference from discussions led at San Francisco by F. U. Naylor and Ed Maynard, PG and E, and at Los Angeles by C. L. Noland and W. K. Dunkle, So. Cal. Ed.

*Meter Reading*—While the housing shortage might indicate that matching meter locks and unlocks, with resultant saving in manpower, should be a simple matter, local conditions must dictate procedure, it was determined at San Francisco. All utilities represented are matching locks and unlocks where possible, but the majority indicated that too long a delay in complying with a lock request would create mistrust in the billing procedure. In a large urban community, locks are held five days and 75% are matched with unlocks within the period, with the adjustment department reporting no billing complaints. It was admitted, however, that in many instances, the dwelling is occupied without the company's knowledge. Other utilities are holding locks from one day to one week, one reporting complaints on delays of two or three days, with the result that the company now waits one day and that only on rural routes.

F. C. McLaughlin L. S. Heseman

*Missed meter readings* are another source of trouble, and here again practices are dependent upon local conditions. In San Francisco, where both adult members of a family frequently are working, PG and E is employing special men to pick up missed readings. In many smaller urban communities, no attempt is made to pick up the reading the first month. Sierra Pacific Power Co. sends an average bill to its Reno customers, with a sticker attached, telling the customer that the bill will be corrected on the next reading. The utility then makes every effort to secure a reading the second month. Payment record on this system has been good and complaints few, it was reported. Rural meters in the Reno area are read every three months, with an estimated bill preferred to post card readings for the intervening months.

While some few reported success with post card readings, the system was declared generally unsatisfactory. Experience seems to be summed up in the comment: "About 40% of the people send them in and of that 40% about 60% give the wrong reading."

Since utilities must accept what manpower is available, the subject of meter reader personnel had been pretty well exhausted in previous meetings. Training the new meter reader, however, is still a pressing problem. While several companies are using some form of instruction sheet, Coast Counties Gas & Electric Co. seems to be the most ambitious in this respect. Convinced of the need of detailed written instruction to supplement other training, this company is preparing a meter reader's manual, which will contain all necessary information.

Coast Counties gives its new readers a two-week training with experienced men, changing instructors several times during the period. Other companies are following much the same procedure, with training time varying from 10 days to one month. Meter books, for the most part, are coded and route maps are included in many cases. It was suggested that, while the new employee is making his rounds with an experienced reader, the latter should hold the meter book and enter the reading called off to him by the novice, eliminating the tendency to match the new reading with the old.

Apparently no company trusts maximum demand meters to new employees, some having special men for this job and others preparing blue prints for each maximum demand meter. In one division office, it was discovered that eight out of 12 meter readers could not read maximum demand meters and a one-day course of instruction was given to correct the situation.

*Credit*—Procedure on extension of credit to military personnel and war workers varies from acceptance of a connect order by phone and without reference, to firm adherence to the rule that, where credit reference cannot be furnished, a deposit must be made before service is given.

Credit history cards were advanced as an excellent means of allowing the customer to establish his own rating. One company establishes such a record only after it has sent three cut off notices during one year; another automatically prepares a history for every customer, regardless of his payment record.

Although some utilities issue refund checks for as little as one cent, it was conceded that drafts should not be used for amounts under 25c and possibly under $1. PG and E representatives reported that divisions have the option of sending stamps or drafts. Experience has been that about 40% of the drafts are not cashed, and these must be carried on the books. Coin, given by some companies for amounts under $1, and stamps have the disadvantage that, in mail transactions, no receipt is provided. Stamps, it was pointed out, are of no use to a soldier. One of the companies represented solves this problem by informing customers in writing of any small credit due them. If a letter is not answered, the credit is absorbed; a record is kept and, if the customer comes back on the utility's lines or later communicates with the company, the money is returned. Another reporting company appropriates any balance under 25 cents.

Although auditor's verification notices may be the only means of gaining certain data, they are causing

R. R. Walbridge C. E. Houston

headaches for customer relations men, according to those present at the San Francisco meeting. It was suggested that customers do not understand the word "verification" and that a change in wording of the form might help. Coast Counties reported good results with a form including in large type the words, "This is not a request for payment."

**Personnel**

Personnel problems, with emphasis on employment, employee training and grievance procedure, were reviewed in Los Angeles at a forum led by R. G. Kenyon, So. Cal. Ed. At San Francisco, A. J. Noia, PG and E, arranged for appearance on the program of Mrs. Rena Brewster, head of the California Department of Industrial Welfare and E. D. Hollander, of the War Manpower Commission.

Hollander told of the commission's work to balance labor supply and demand and explained the system of "priorities" allocating available personnel according to (1) urgency for production and (2) urgency of manpower need. He stated that such priorities may shift within a week's time. Preference alone provides no grounds for employee clearance, he declared.

Mrs. Brewster stressed her desire to cooperate with industry, pointing to the departure from the old "complaint" system, which penalized one concern while another next door followed identical practices without censure. With increased women personnel, she urged employers to protect themselves against unwitting infraction of rules and invited them to call upon her for assistance where procedure was doubtful. She recommended 10-minute rest periods for women and, where many women were employed, the hiring of a competent woman councilor.

*Employee training* — Reporting on the company's program to train women for substation construction work, PG and E representatives pronounced the plan a success but warned that, in adopting such a plan, it was necessary first to sell the idea to foremen and other men working on the job. Women have responded well, it was stated, with wives of men working on the job proving the most practical workers because of transportation limitations.

The two-week training includes detailed information on equipment and functions of a substation, company and electrical safety rules and practices. To give a woman a small detail for an actual construction job was found to be the most effective method of training her to handle tools. It was also recommended that work be diversified at first and that the necessity for accuracy be explained carefully. Instructors must realize, it was pointed out, that the vocabulary, so familiar to men, is entirely new to women.

**Materials and Equipment**

Declaring that the war really will come home to the Pacific Coast with the end of the European conflict and direction of United Nation might to the Pacific theater, H. H. Fogwell, Thermador Electric Mfg. Co., warned those at Los Angeles that industry must prepare now for this event, which will tax facilities to the utmost. Distinct possibilities for the future, he prophesied, are further restrictions on civilian travel; increased demand for electric power even to the point of restricted civilian use; overtaxed storage facilities; stepped up tempo in aircraft and shipbuilding production; increased demands on agriculture and on wholesalers.

Labor shortage was another problem cited as needing careful study. It was suggested also that with the close of the European war, Eastern industry might be permitted to start civilian production, thus "getting the jump" on the Pacific Coast in the bid for post-war markets.

C. W. Goodwin led a discussion of the same subject at San Francisco, with R. E. Fisher, PG and E, chairman of the PCEA planning committee, participating.

*Priorities and regulation*—That the revised Utility Order U-1 of Sept. 24 had eliminated most of the confusion resulting from earlier versions was the consensus of forums on Utility Order U-1 and supplementary orders, led at Los Angeles by B. D. Haugh and Paul Griffith, So. Cal. Ed., and at San Francisco by D. G. Martin, J. O. Jones and R. L. Mendes, PG and E.

In answer to the question: "What means are employed to segregate material in inventory purchased on AA-1 from that purchased on AA-3?" discussion at Los Angeles developed several methods, one being to segregate by items such material as transformers, switches, fuseholders, copper, etc., and to control upon a dollar basis by classes use of material and purchase commitments for small items. It was pointed out that in the case of items purchased by keg, barrel, drum, etc., it is not practical to maintain detailed records to determine the portions used under AA-1 and AA-3. It was recommended that further study be made of the problem of segregation based on purchased ratings.

Sales of surplus materials and OPA regulations governing them were discussed in forums led in Los Angeles by Bruce Renwick, So. Cal. Ed., and at San Francisco by D. G. Martin.

*Equipment* — Forums on materials and supplies were conducted at San Francisco by J. P. Schaefer, Coast Counties G & E, and at Los Angeles by William DeWaard, San Diego G & E.

Out of a discussion of transformer rehabilitation participated in by A. W. Pride, Westinghouse, C. R. Benson, G-E and M. F. Beisber, Line Material Co., came the recommendation that small transformers of 1½ and 3 kw. should be scrapped rather than rewound. With larger transformers, availability of facilities and other factors should determine utility practice and decision should follow conference with manufacturers, it was recommended. Consensus was that rehabili-

From left to right: T. W. Erickson and R. A. Moulthrop, Oakland; W. N. Lindblad, Emeryville; T. C. Wren, Reno, and E. L. Hughes, San Francisco

tation is not justified where saving is less than 30%.

At Los Angeles, W. J. McCullough, of the War Production Board, stated that in view of the present shortage of transformers in excess inventories, condition of each transformer should be carefully considered to determine whether feasible to rewind or scrap. UF-23 should be used in replacing transformers, he said.

It was agreed that, in rewinding transformers, manufacturer's serial numbers should be retained unless the utility was set up to identify transformers during life by means of a "company number."

WPB requirements, delay in securing needed materials and reduction of excess inventories were cited as contributing to use of substitute materials. Substitutions are being made generally as follows: one-fourth-inch steel conductor for copper conductor in primary circuits, and copperweld conductor in place of one-fourth-inch steel to use up temporary stockpile; black braces for galvanized braces to support crossarms; wood in place of steel fencing for consumer substations; pin type for post type insulators.

#### Accounting

Federal taxation and regulation in relation to pay roll accounting was discussed at Los Angeles by P. Boyington, So. Cal. Ed., who brought out the effects on procedure of social security, victory and withholding taxes. F. C. McLaughlin described the Utilities Wartime Aid Program and the accounting difficulties involved. Accounting problems presented by bi-monthly meter reading and billing were discussed by R. C. Kiser and M. L. Rugless, So. Cal. Ed., from the points of view of the field forces and monthly and annual reports and statements. Difficulty of assembling statistics in such a way that requirements of management, investors and regulatory commissions can be met in one set of figures was stressed by F. W. Morris, So. Cal. Ed., in a discussion of *Uniformity of Operating Statistics in Financial Reports.* D. C. Martin and Harry McGann, PG and E, led discussions on similar topics at the San Francisco meeting.

Westerners on the standards committee and its several subcommittees established by the Fluorescent Lighting Assn., an association of cold-cathode fluorescent lighting manufacturers, include Leon F. Moore, Electrical Products Consolidated, Seattle, on the fluorescent lamp committee, and L. A. Rice, Electrical Products Corp., Los Angeles, on the accessories committee. Other committees are one on fluorescent tubing, fluorescent fixtures and transformers. Standards are to cover products and installation practices.

# Northwest Meeting

Sales managers of utility companies of the Pacific Northwest and former manufacturers and jobbers of electrical appliances gathered in Seattle Dec. 10 and 11 for a conference under the auspices of the Utilization Section, Northwest Electric Light & Power Assn. C. E. Hess, Puget Sound Power & Light Co., chairman of the section, was chairman of the meeting, which was conducted in round-table manner without formal presentation of papers but with a discussion leader for each subject.

Principal subjects for discussion were the distribution of the limited volume of electrical merchandise to be available for civilian distribution when the peak war production is reached, an exchange of ideas on handling the voluntary conservation program recently made acute in Coast cities by the lifting of the dimout, and a possible program for after the war for electrical dealers and contractors. Other subjects bearing on wartime operation and laying the ground work for postwar planning were on the program. Representatives from the five Northwest states and British Columbia were presented at the meeting.

# IBEW Conference

Culminating a seven-day, Monday through Sunday, intensive day and evening conference of its international representatives from six Western states and business managers from California, the International Brotherhood of Electrical Workers was addressed on the final day by several industry speakers. Dr. Paul J. Raver, Bonneville Power Administration head, spoke at the dinner, Nov. 20, in San Francisco. J. Scott Milne, IBEW vice-president, presided.

At the morning session J. A. Hill, Pacific Gas and Electric Co., San Francisco, presented a postwar rewiring program (see p. 61) to the union representatives who met the idea with enthusiasm. Sam Bloom, electrical engineer, California Railroad Commission, was another industry speaker. Others on the program represented the Social Security Board, the Industrial Accident Commission, and the state Federation of Labor.

Purpose of the week-long conference, said Milne, was to bring about uniformity of interpretation of labor regulations, working rules and procedures and to analyse all actions of the preceding year in respect to these procedures. Virtually a school for the organization's executives, he declared the conference to be.

Howard M. Sharp, president, Illuminating Engineering Society, Buffalo, N. Y., completed a tour of chapters and sections of the organization in the West during early November. In Seattle he addressed the Electric Club of Washington Nov. 2; the Engineers' Club and a joint meeting of the IES and the American Institute of Architects. In Portland Nov. 5 he addressed a luncheon of the Electric Club and a dinner sponsored by the IES for the electrical industry of Portland. In the San Francisco Bay region Nov. 8 he addressed the San Francisco Electric Club; Nov. 9 a meeting of the San Francisco Bay Section, IES, and Nov. 10 an industry meeting in Oakland sponsored by the IES and to which other engineering societies were invited. In Los Angeles he addressed the IES at a special meeting Nov. 12, and made a tour of lighting installations of the region Nov. 13. In Denver Nov. 16 he addressed the Colorado Engineering Society and Nov. 17 the Rocky Mountain Chapter, IES. For summary of his talks to both types of groups see the report in the lighting and wiring section, this issue.

Rocky Mountain Chapter, International Assn. of Electrical Inspectors, at its Nov. 9 meeting in Denver, decided upon a program to familiarize all with the Code and its interpretations and likewise to create a forum for discussion of problems. C. B. Farrah, chairman, outlined this plan. V. C. Moulton, secretary talked of the postwar planning committee's work and the need for sales control ordinances. Code study, it was decided, will be divided into a study period, article by article, followed by a session on Code problems. Meetings are to be held the second Tuesday evening of each month. Bob Chedister, Carl Simon and V. C. Moulton were appointed to handle Code questions. Another committee on program and arrangements consists of D. G. Mulligan, E. J. Strohminger and B. P. Hodges.

Electrical Maintenance Engineers of Southern California heard R. W. Steenrod, General Electric Co., discuss *Electric Heating in Industry* at the Nov. 17 meeting, Los Angeles. He discussed the use of heat by primitive man in making weapons, contrasting these ancient heat-treating methods to present day electric methods. He illustrated the talk with slides of new types of furnaces and of equipment for creating protective atmospheres in heat treating.—Henry Bush, educational chairman.

Electrical Maintenance Engineers of Northern California were to join the AIEE at a meeting Dec. 3, at PG and E Auditorium, San Francisco, to hear Lt. Capillo, engineer office, Submarine Service, U.S.N., speak on performance of electrical and mechanical equipment on submarines under extreme operating conditions.

East Bay Electric Clubs, Oakland, Calif. recently heard about cab signaling and automatic speed control on the San Francisco Bay Bridge. Speaker was G. M. Robertson, Key System engineer. At another meeting George Tudhope told about the city's recently installed two-way police radio system.

San Diego County Chapter, National Electrical Contractors Assn., held two meetings, one a regular and another a special one, recently to discuss the labor situation. Speakers were Messrs. Lunbergh and Bruno Barth. Secretary is Tom Goetze, of Ace Electric Co.

**ELECTRICAL WEST**

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## A $175,000,000 Fantasy

A CARDINAL tenet of political strategy is never to appear ridiculous. Once a candidate or an issue becomes the target for public derision, it is only a short step to disrespect and defeat. The directors of the Hood River (Ore.) PUD and their advisors either were unaware of this political philosophy or ignored it when they announced plans for an election to vote upon the issuance of $175,000,000 of revenue bonds for the ultimate acquisition of the three major power companies serving northern Oregon and southern Washington. The fantastic character of the proposal can be illustrated by the statement of one editor that he read the story three times before he realized that the typographer had not made a mistake of at least three ciphers in the $175,000,000 figure.

The Hood River PUD represents a rural section with a total population of approximately 6,500. It has endeavored to get into the utility business without success for four years. Now it proposes to take over utilities with a service area population a hundred times greater than its own.

Fantastic schemes such as this one, coupled with other recent developments on the PUD front, certainly will cool the ardor of the people of the Northwest for public power. One PUD already has been forced to increase rates. A second has had to increase its tax levy to meet operating costs and fixed charges on its debt. The Central Lincoln County PUD which took over $750,000 of utility properties along the Oregon coast, mostly outside its territorial limits, is having its operating difficulties. In Washington the so-called Tri-County PUD takeover of a section of Puget Sound Power & Light Company has been dropped.

Under such circumstances it is difficult to imagine how voters can give serious consideration to the fantastic Hood River proposal. They should laugh it off the ballot.

## Customers Made This Business

JUST the other day a purchasing agent recited an incident where the goodwill built up over ten year's time was destroyed in ten minutes by a thoughtless salesman who let the critical conditions brought on by the war overcome tact and good judgment. He inferred to the purchasing agent that if he didn't like the price and shipping conditions for his goods, he could try to get the same materials somewhere else.

It's an easy matter to let the war become the excuse for almost any kind of an oversight in business today. But there will be a day of reckoning for every such oversight. Ralph Heininger, general traffic manager for Chicago and Southern Airlines, recently told his organization something to remember in times like these. His statement ought to be pasted in front of every person whose work puts him in contact with the public. Here it is:

"Customers made our business—customers will keep us in business. There is no excuse for lack of courtesy—no excuse for being impatient. There is no legal rationing of politeness—no curtailment of smiles. There is no official ceiling on being pleasant while on the job."

## Easy Way Out

GRATIFYING as is the Federal Power Commission's recent order rescinding its earlier directive that the Washington Water Power Company act as "common carrier" for Bonneville power to two small army installations, the real points at issue in this controversy are far from settled. In fact those familiar with the issues incline to the position that the FPC took the easy way out.

The initial presidential directive to the FPC enunciated a new policy, which if carried out, would have far-reaching effect on the electric utilities. By effectuating the "cheapest rate" for war plants and war establishments, even though the "common carrier" principle was involved, a means was set up for wholesale invasion of territories far beyond the normal service area of government-

owned power agencies. Obviously some of the war establishments might be government-financed industrial plants. In some instances too, application of the policy might be used to bolster finances of REAs or PUDs. Also, if there were rate differentials involved, the practice could be highly discriminatory.

When the FPC order against the Washington company was first promulgated, the loads involved —estimated at 700 and 500 kw. respectively— were less than the 1,000-kw. minimum originally set by the commission. Also they were less than a similar figure agreed upon between the company and the Bonneville Power Administration as to what might constitute a war load for which the utility would wheel power. Both of those conditions were ignored.

The whole affair gave off a distinctly unattractive odor in the very beginning. Backing down now because the total loads allegedly have not exceeded 366 kw. does not change the smell.

## One Problem—One Answer

ONE of the major postwar questions industry wants answered is the disposition that the federal government will make of its huge investment in industrial facilities. Whether these are to become yardstick plants—owned and operated by the government—whether they are to be sold to present operators or to the highest bidder, or whether they are to be dismantled and exported for the reconstruction of war swept foreign countries are matters of prime importance.

The electric utilities can sympathize with industry over its concern with this vital problem. Time was when the utility industry stood alone in the shadow of socialization. Government owned upwards of one-eighth of the total investment in utility facilities. Today however, more than one-fifth of the non-utility industrial facilities are owned by government. This includes everything from complete industrial establishments down to factory annexes or even individual banks of machines in an existing factory.

Many industrial organizations hope to be able to purchase these government facilities. It would be logical and economical to integrate them into other similar establishments already corporately owned. If such an argument is valid for industry, so too is the thought that physical and corporate integration of utilities might include the purchase of existing government-owned facilities. If private investment and business management could take over, there would be definite public benefits. A large portion of the public debt might be retired. Certainly the tax load necessary to service this debt would be reduced. And better still, billions of new property would then be returned to the tax rolls.

In its present plight we hope that industry will look sympathetically at the problem of the utilities. Since the question is common, maybe they can get together on a common answer.

## Christmas 1943

LESS of goods and things, but perhaps, as inner compensation, more of the spirit, the meaning of Christmas in this of 1943. Values of what we still have are certainly more truly appreciated as seen against the dark shadow of war and of threatened death of all that we hold dear in life.

Less lights, but certainly no less cheer in those which do sparkle within, rather than outside, the homes of the West this season.

Less travel and going about, but more of the meaning of home and family. This is felt especially in those homes from which members are away to war or are engaged elsewhere fulfilling some of its many urgent requirements.

Less food, perhaps, but keener relish of that which we still have. And a truer appreciation of how much more abundance we still have than have other unfortunate peoples the world over.

Less spirits for the punch bowl but more spirit in the heart, where it is not synthetic.

Less money foolishly spent because more of it has gone into War Bonds and taxes to pay as we go. Some of our gifts, in lieu of goods and things, are bonds, which are a pledge for a better, saner future, more in the spirit of Christmas.

Less fixings and fuss and froth—but more truly Christmas than with them, more in the name of Him after Whom it was called *Christ*mas.

*TOO much emphasis, it seems to me, has been laid on the requirement of high level employment and not not enough on that of high level production. We cannot solve our postwar problems merely by writing the names of millions on pay rolls, public or private. Unless we put them to work at useful tasks, producing the goods and services that really make up what we call our living standards, we shall but postpone the day of social and economic collapse. And such production, it seems to me, is for the most part, a job for business enterprise, rather than for political government. Someone will have to do it; it remains to be seen who it will be.*—Willard T. Chevalier, publisher, *Business Week*.

# NEWS of the industry

## HOOD RIVER PUD PROPOSES $175,000,000 BOND ISSUE

Voters within the Hood River (Ore.) Public Utility District will be asked to ballot Jan. 7 on a proposed $175,000,000 revenue bond issue to put the district into the electric power business.

If the plan as envisaged by the PUD board of directors were executed, the district, with a population of about 6,500, at least temporarily would control and operate all major electric systems serving northern Oregon, parts of central Oregon and parts of Washington.

Pacific Power & Light Co., which serves the Hood River area, is valued in its entirety at approximately $43,000,000. Inference is that the district also would attempt to acquire Northwestern Electric and Portland General Electric companies. This ambitious program is the result of four year's planning and, according to the district, is made necessary by "interlocked" and "intercompany" relationships, which, it says, make it practically impossible to buy the distribution facilities in Hood River County alone, or even to purchase the entire PP and L system by itself.

The PUD includes only rural sections of Hood River County. The City of Hood River voted itself out in the June 1939 election which created the district.

Patterned on the Nebraska plan, by which a small district purchased 16 separate companies serving areas of the state outside Omaha, the Hood River proposal was announced in a full page local newspaper advertisement on Nov. 19. The plan contemplates partition of properties outside Hood River County into divisions later to be taken over by PUDs or other public agencies. According to the announcement, the PUD does not "want or intend to forever be the owner of properties outside of Hood River County" but it "does not intend to make its acquisition program dependent upon anyone but itself."

Price would be based on ability to pay for the system out of revenues within a 20- or 30-year period, it is stated. A series of revenue bonds would be issued for each division and revenues of each division pledged to the payment of its bonds. A guarantee would be provided against failure of one division's affecting another.

Guy C. Myers, New York broker, is financial adviser for the district. Myers has been prominent in previous public financing programs in the Northwest, among them that of the City of Cascade Locks, Ore. His agreement with the Hood River group would allow him commission of 2½% on the sale of the first $4,000,000 in bonds, 1½% on the next $10,000,000 and 1% on the remaining $161,000,000. If the entire proposed issue were sold, he would receive $1,411,000.

Engineer for the district is R. W. Beck, former Bonneville engineer, who has been adviser for several PUDs and municipals in Oregon and Washington, as well as for the power district at Columbus, Neb. and the City of Key West, Fla.

Purchase by the Central Lincoln County PUD of West Coast Power Co. properties in four counties two years ago set a precedent in Oregon for PUD operation outside its own boundaries. A total of $750,000 was involved in this sale.

## Tri-County PUD Drops Efforts To Secure Utility Properties

Decision to drop all efforts to secure property of Puget Sound Power & Light Co. in Thurston, Cowlitz and Lewis counties, Wash. was announced last month by members of the Tri-County PUD through their attorney E. K. Murray.

It was believed that the move was the result of inability of the districts to finance purchase at prices set recently by the federal court in condemnation proceedings. The jury verdict placed the value of the combined properties at $7,600,000. Highest price considered by the districts was $5,064,000.

The three counties, acting together under an agreement that no one of them would take over properties in its district unless the other two agreed to do likewise, entered the condemnation proceedings more than a year ago.

● By a vote of 1,655 to 1,387, voters of Tucson, Ariz., on Oct. 30 turned down a proposal for municipal purchase of Tucson Gas, Electric Light & Power Co. properties. Issuance of $8,500,000 in revenue bonds was included in the proposal which is said to have created one of the hottest pre-election campaigns in the city's history.

## UTILITY HOLDINGS GO TO PRIVATE INVESTORS

With the sale of 875,000 shares of common stock for $21,875,000, transfer of holdings in Public Service Co. of Colorado from Cities Service Power & Light to private investors was completed in November. According to investment houses handling the securities, the stock found a ready market.

Completing the reorganization, John E. Loiseau was named president to succeed Guy E. Faller, now chairman of the board of directors. William D. Virtue is vice-president and secretary, D. G. Guiney treasurer.

The stock was priced at $25 a share and will yield 6.6% on the basis of anticipated dividends of $1.65 a share per year. Cities Service received $20,453,125, the rest going to pay legal and brokerage fees.

The transaction contained the provision that Cities Service contribute $9,513,500 worth of its stock holdings in Public Service to the company. This amount will be credited to a reserve for plant account adjustments and will bring total reserves to more than $22,000,000.

A petition to list Public Service common stock on the New York stock exchange will be made within two years or less.

New capital structure of Public Service will be: first mortgage bonds, $40,000,000; 4% sinking fund debentures, $9,700,000; 7% preferred stock, $100 par value, 27,492 shares; 6% preferred, $100 par value, 32,313 shares; 5% preferred, $100 par value, 2,394 shares; common stock, $20 par value, 875,000 shares.

● Southern Colorado Power Co. has secured SEC approval to a recapitalization plan by which Standard Gas & Electric Co. relinquishes control of the utility. Filed under the corporate simplification clause of the holding company act, the plan provides a single class of common stock. Interest saving of $185,000 annually will be realized, it is stated.

● U. S. Circuit Court of appeals last month upheld its 1942 decision declaring Pacific Gas and Electric Co. a subsidiary of the North American Co. of New York and as such subject to regulations of the holding company act. North American holds 17.71% of PG and E stock.

"...FROM THE HORSE'S MOUTH."

In addition to ultimate limits data, SHORT-TIME RATINGS for overloading are invaluable to us. Most of our equipment is protected with automatic alarm devices. If we know the duration of the overload period of a transformer, our men know how soon they must get to an overloaded transformer in order to avoid breakdown.

If we knew at what point the insulation starts to char, how long it takes for this to happen, we'd be much more able to load up equipment. Every big piece of equipment can withstand high temperature for a certain length of time. It takes some time before the high temperature has saturated the equipment to such a point that a rapid increase in temperature to the breakdown point occurs. We need that information today.

* * *

Can the transformer manufacturers tell us what accessories are available on various classes of DISTRIBUTION TRANSFORMERS? For example: are drainage plugs, filter-press connections, oil-sampling devices, oil gauges, thermometers, etc., included as standard equipment on distribution transformers of 50 kva and over or 250 kva and over? There is need for some clarification on this.

* * *

The above is an excerpt from the "E-A" Reporter, issued by the publishers of Electrical World.

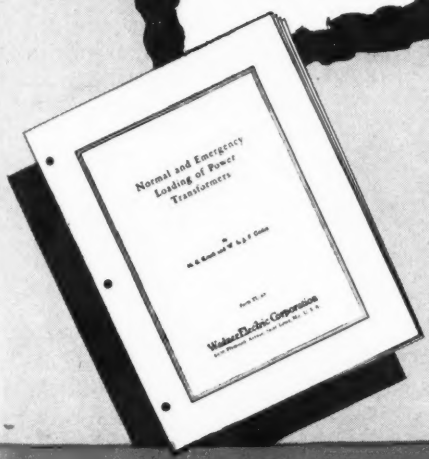
# When Questions Like These Arise WAGNER Has the Answers

Answers to questions such as asked in the "E-A" Reporter are of vital importance to all transformer users.

Wagner Bulletin TU-40 on "Normal and Emergency Loading of Power Transformers" is a comprehensive treatise on the subject of transformer overload, and Bulletin TU-180 answers the questions of design and construction of distribution transformers, and also includes information on available accessories.

These bulletins have been edited by qualified transformer engineers, and are only a few of the many bulletins that should be in the hands of everyone responsible for the purchase, installation, and maintenance of transformers.

No matter what your transformer requirements may be, or what your transformer problems are, consult the nearest of Wagner's 29 branch offices, located in principal cities and manned by trained field engineers.

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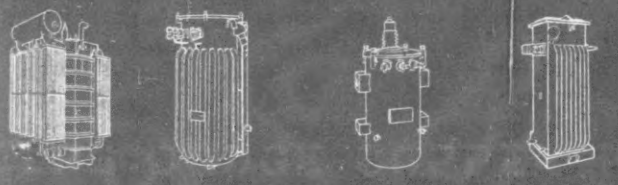
# Wagner TRANSFORMERS



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## FPC RESCINDS ORDER TO "WHEEL" POWER

The Federal Power Commission has rescinded its order of last February, requiring the Washington Water Power Co. to permit use of company lines for transmission of Bonneville power to two government bases—Fort George Wright and Baxter General Hospital in Spokane. The order was an application of the "common carrier" principle of the President's Oct. 22, 1942 "cheapest power" directive.

At the time the order was executed. Kinsey M. Robinson, president of Washington Water Power, protested that the company was prepared to serve the fort and the hospital at an estimated annual saving to the United States government of $4,400 as compared with the Bonneville proposal.

Yielding to company requests for a public hearing, the power commission held hearings in Washington, D. C., on April 5 and 6, at which the company asserted the commission's order enabled two government agencies to circumvent a contract entered into by one of them and to enable Bonneville power to be sold at the expense of private enterprise.

"The intent of the Federal Power Commission to force the Washington Water Power Co. to allow the tax-free, subsidized Bonneville project to use the lines of the local company to furnish power at higher cost to the government, is unmistakable by the terms of the order," Robinson declared.

Although the rescinding order was made public without comment by FPC, it contained the statement that Bonneville had notified the commission last month that the combined loads never exceeded 366 kw. It was apparent thus that the commission's justification for rescinding its Feb. 15 order was that the contract failed to qualify for consideration under the Oct. 22 directive, because it was less than 1,000 kw. To facilitate administration of the directive, FPC had ruled that it would consider under it only those contracts of 1,000 kw. demand or more, unless the procurement agency specifically asked that a smaller contract be administered under the directive. The Army, procurement agency in this case, made no such request. It was pointed out that the Army would have had a chance to make such a request had it so chosen, when the order was circulated among interested agencies before service.

Sources close to FPC warned that rescinding of the Washington order does not mean that the "common carrier" principle is dead. They pointed out that the principle is part of an executive order and must be considered by the commission in adjudicating cases which qualify under the 1,000-kw. regulation.

Because of the fundamentality of the issues raised by Robinson at the April hearings, it was considered by some that FPC, in rescinding its order, had seized an easy escape from the necessity of ruling on a highly debatable question.

## Court Order Holds Up Rate Reduction in Portland

A court restraining order last month held up an $800,000 rate reduction ordered for Portland General Electric Co. by the Oregon Public Utilities Commission. The temporary restraining order was issued by the federal district court on petition of the independent trustees of Pepco, of which PGE is a subsidiary.

The commission, which has filed an "order to dismiss," claims that the company shows "unreasonable profits" and that emergency provisions of the utilities act should be applied.

Stating that PGE has no excess earnings, the independent trustees declared that no emergency exists and that an arbitrary emergency order has no precedent. They further pointed out that Pepco is reorganizing and all of its assets, including capital stock of PGE, are under court jurisdiction and that bondholders might contend that such a rate reduction proved that the preferred stockholders were without an equity in the property.

## B. C. Customers Get Rebate On Electric Service

A dividend in free electricity is British Columbia Electric Railway Co.'s Christmas present to its customers in Vancouver and the lower mainland area.

Amounting to approximately $1,000,000 the rebate plan provides a free billing period between Nov. 18 and Dec. 18, and includes residential service, commercial lighting and heating, certain commercial power installations, municipal street lighting, public schools and general hospitals.

Publicity urged benefiting customers (1) not to waste electricity (2) to put the money saved into war stamps. The Public Utilities Commission order provides that customers who take advantage of the situation to use more electric power and light than usual may be billed for the excess consumption.

# HABIRSHAW GAS-FILLED CABLE

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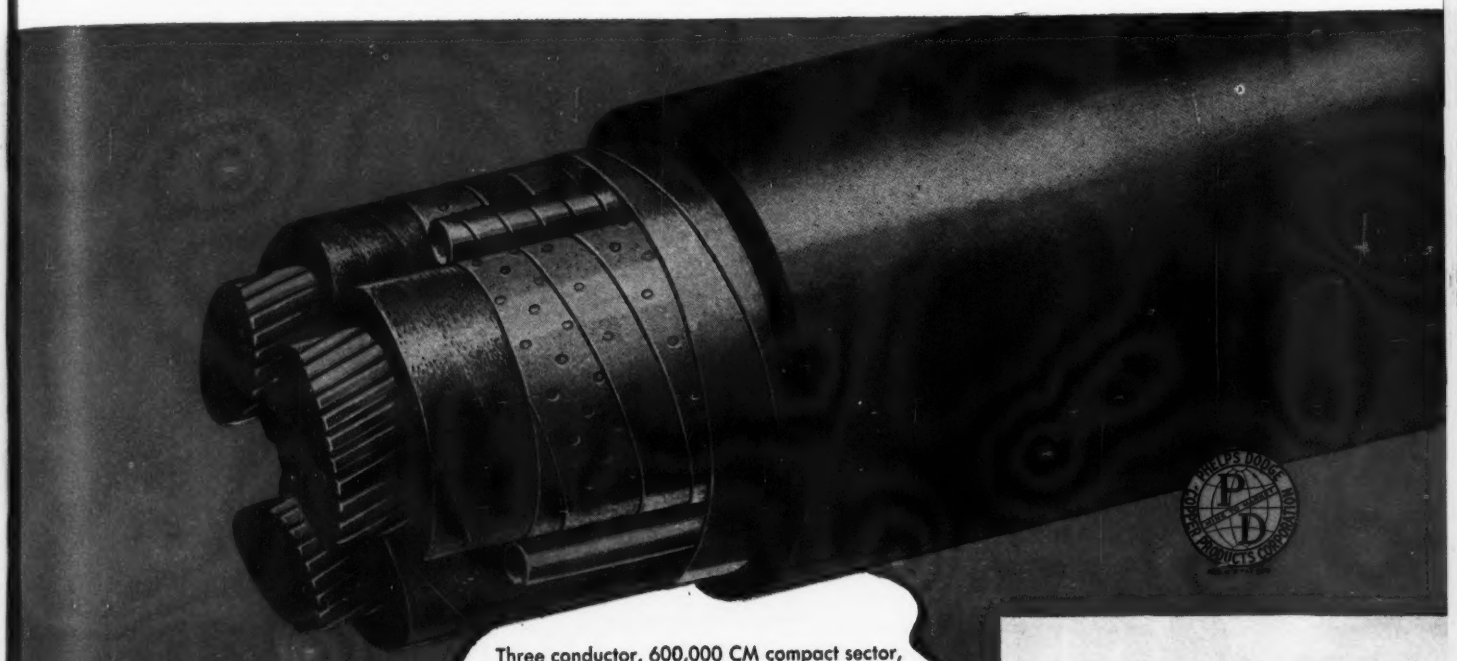

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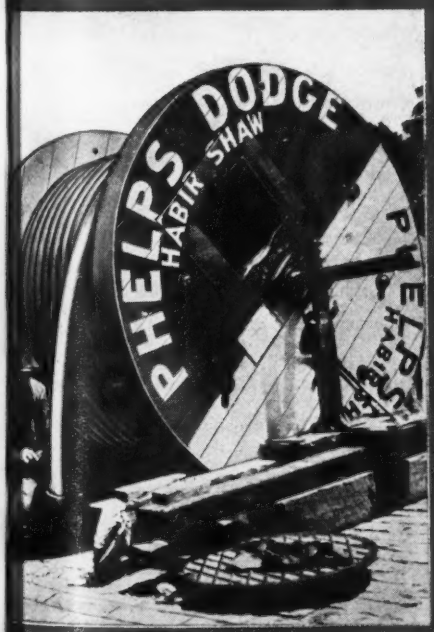
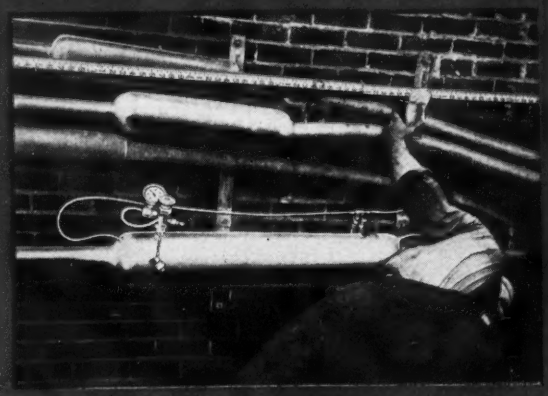
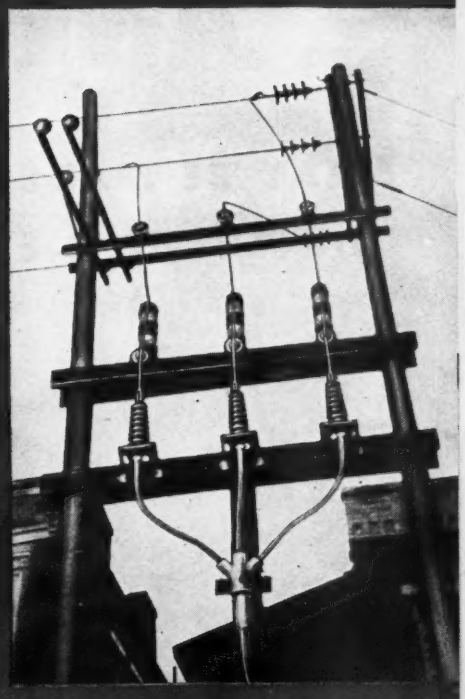



Easy Installation



Simple Joints



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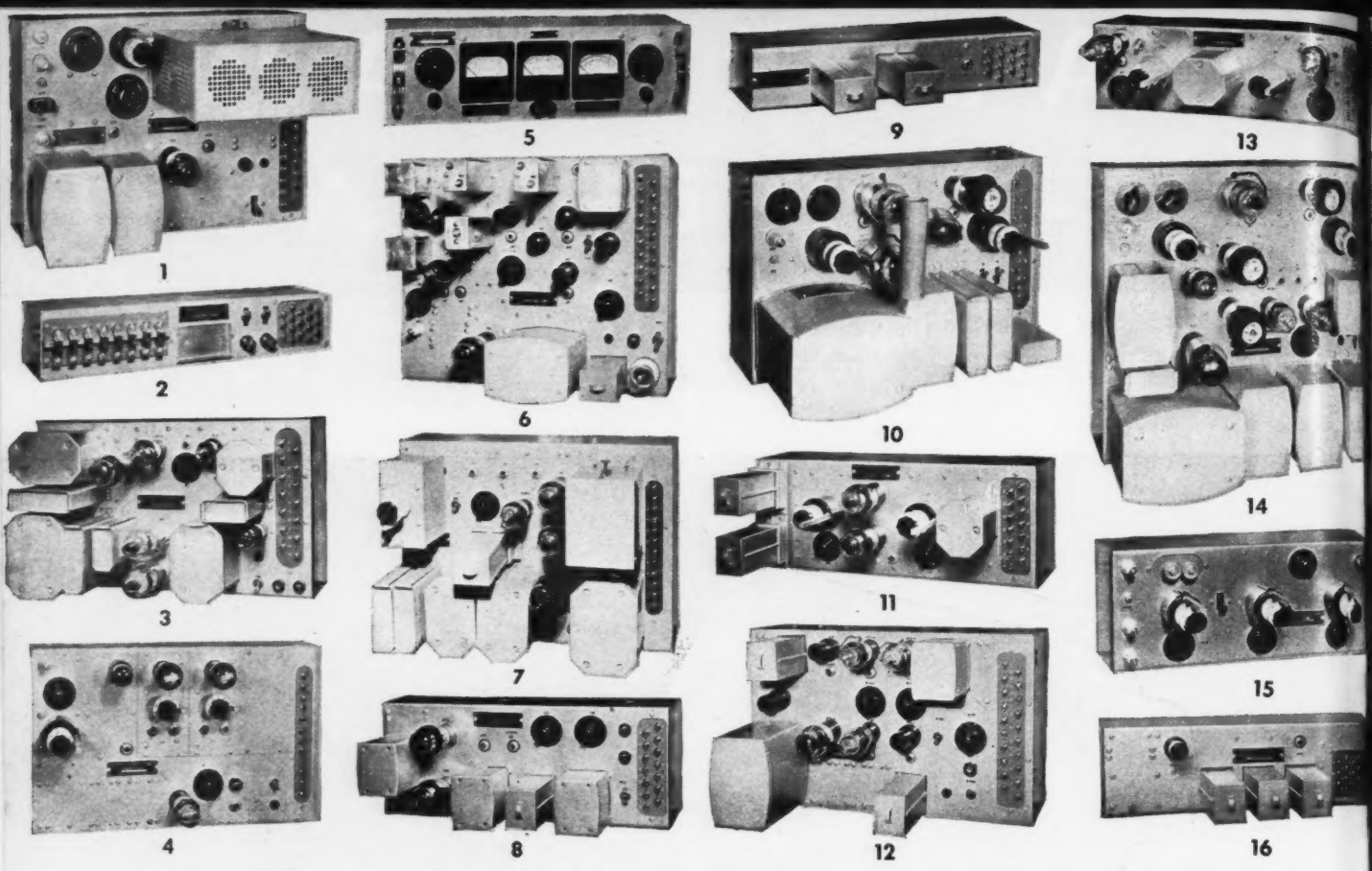


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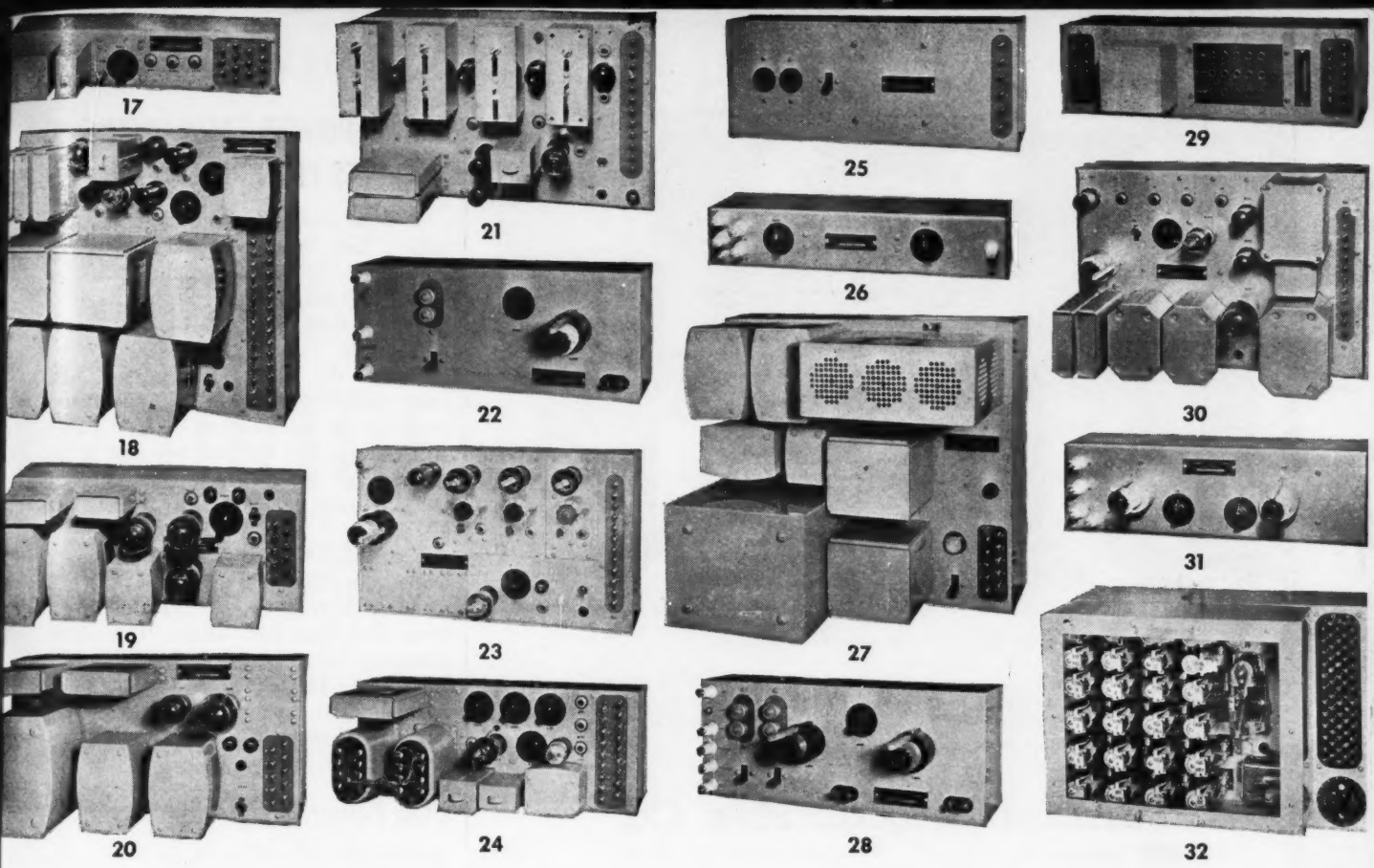


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14. Transmitter-modulator, 50-150 kc.
15. Two-frequency line tuning.
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17. Single-frequency duplex telephone code ring.
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19. Audio amplifier.
20. Power supply for audio units.
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26. Impedance matching transformer.
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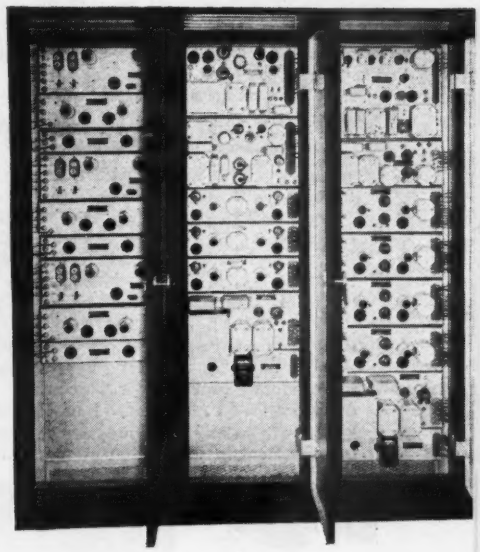
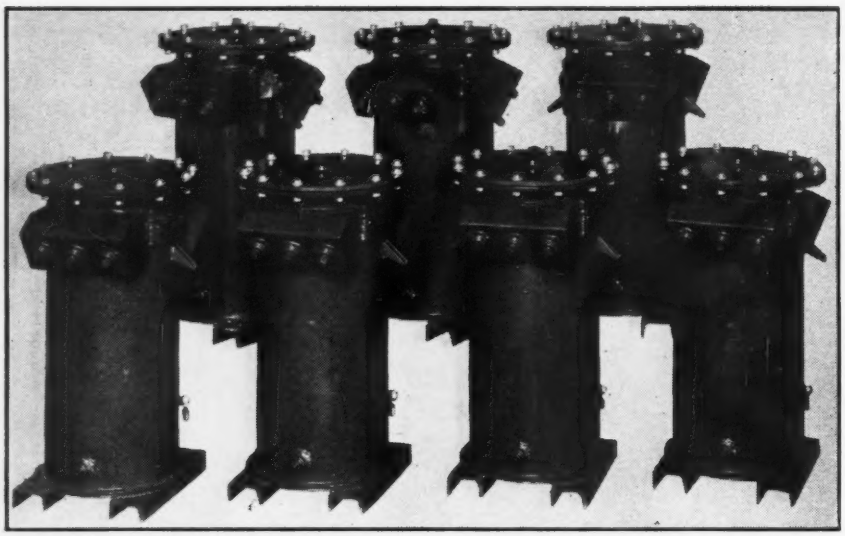


# CARRIER CURRENT

***THE NERVE NETWORK OF THE POWER SYSTEM***



7—5 KVA Subway Type Transformers, 2400 Volts to 120/240 Volts, Single Phase. Wiping sleeves supplied but not shown in photograph

Pictured above are efficient, sturdily-built, competitive-priced GARDNER Subway Transformers recently supplied to one of the largest electric utilities on the Pacific Coast. Rugged in construction and absolutely water-tight, these transformers built by Gardner are competitive in price.
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SPECIFICATIONS MAINTENANCE: The louver assembly consists of bottom, sides and ends assembled in one unit. Releasing two spring catches on either side of the fixture permits it to hinge from the remaining two spring catches for cleaning and lamp replacement. To remove completely release all four catches. WATTAGE: For four 40-watt fluorescent lamps.

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## IDAHO POWER REFINANCING RECEIVES FPC APPROVAL

Federal Power Commission authorization has been received by Idaho Power Co. for a refinancing plan by which the utility will refund its outstanding debt at a substantial saving in interest.

Under the plan the company will issue $18,000,000 of first mortgage bonds at an interest rate of 3⅛% and will retire a like amount bearing interest rate of 3¾%. Maturing date of the old issue is 1967 and of the new 1973.

The 450,000 shares of common stock owned by Electric Power & Light Co. were sold recently to private investors, divesting the utility of holding company control.

Thirteen large insurance companies have bought the new issue of first mortgage bonds.

## Utah Power & Light Submits Amended Refunding Plan

Utah Power & Light Co. has amended its refunding plan to cover issuance of $42,000,000 principal amount of 25-year first mortgage bonds to be dated Dec. 1, 1943. The original refunding plan provided for sale of $37,000,000 in first mortgage bonds due 1972 and $7,000,000 general mortgage bonds.

If the plan is authorized, the bonds will be sold at competitive bidding, the successful bidder to name the interest rate.

Difference in proceeds between the original and revised plans will be made up out of current cash. This will allow the company to retire $28,119,000 of 30-year first mortgage, 5% gold bonds and $4,068,000 of first lien and general mortgage 4½% gold bonds both due in 1944, and Light and Traction bonds guaranteed by the power company.

● PETITION of Telluride Power Co., Richfield, Utah, for a rehearing on the state public service commission's action in imposing a $1,000 fine on the utility has been granted. The fine was imposed because the company assertedly refused to institute the uniform system of accounts and restate its property on original cost.

● UTAH POWER & LIGHT CO. has filed a 8,700-page record in its appeal to the state supreme court from the public service commission's 1,500,000 rate reduction order. The record is said to be the largest ever filed in the Utah Supreme Court.

# OVER 60 UTILITIES

## using PM plan to help power customers avoid Electrical Breakdowns

Introduced a short time ago, Anaconda's Preventive Maintenance Plan is being widely used by utilities to help customers keep electrical systems operating *efficiently*—despite shortages in essential wiring equipment.

Already some 60 utilities are actively engaged in this program. With it, they are helping their industrial power customers maintain continuous wartime production by preventing electrical breakdowns.

### WHAT THE PLAN IS

The PM plan is a simple but comprehensive way to safeguard war production by preventing electrical breakdowns *before they develop.*

### HOW IT WORKS

The plan provides a practical means of making periodic, systematic analysis of circuits and equipment. Uncovers potential weaknesses . . . suggests ways to correct them . . . prevents overloading of lines.

Data thus gathered aids local W.P.B. Branches in reaching decisions on requests for materials to *prevent* breakdowns.

### HOW UTILITIES BENEFIT

The PM plan helps utilities maintain close customer contact despite a lack of "something to sell." Offers basis for service campaign that definitely appeals to customers. Puts the utility in a leadership role for furthering war production throughout the area it serves.

If you aren't already utilizing the Anaconda Preventive Maintenance Plan, mail the coupon for full details.

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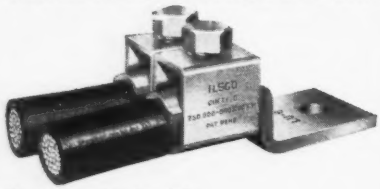

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Wire Rope Fittings


## CELEBRATION TO MARK BONNEVILLE COMPLETION

Completing the power installation at Bonneville Dam, the tenth and final generator will be installed in the power house during December, according to Col. R. A. Tudor, U. S. Army district engineer.

Total capacity of the power house will be 650,000 hp., approximately 518,000 kw. The new unit is the eighth 54,000-kw. machine to be installed at Bonneville. Capacity of each of the first two units is 42,200 kw.

Ceremonies marking completion of the dam will be held on Dec. 14. A nation-wide radio broadcast of the dedication ceremony is planned by General Electric Co.

## Green Light Expected on Nisqually Additions

WPB permission is expected to clear the way for construction of Alder power house in Tacoma (Wash.) City Light's second Nisqually project, according to Superintendent Verne Kent.

A $3,000,000 bond issue to help finance completion of the project has been purchased by a syndicate headed by Grande & Co. and John Nuveen & Co. of Chicago. The bonds mature in from one to 20 years and are to net investors interest rates ranging from 0.4% on the earliest maturities to 1.65% on the latest. It is estimated that the city's interest rate for the issue will be 1.605% per annum.

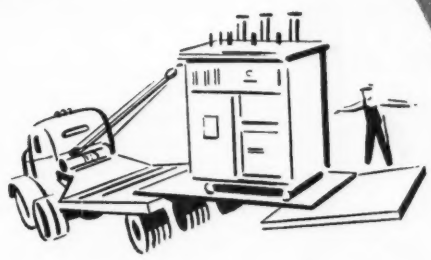
## Senate Committee Asks Funds For REA Probe

The Senate Agriculture Committee has introduced a resolution asking $15,000 with which to conduct its investigation of the organization of political groups to influence rural electrification. This resolution does not otherwise broaden the jurisdiction of the sub-committee which will investigate relations between REA and the National Rural Electric Cooperative Assn.

● RECENT REA allotments in the West include $200,000 to the Redwood Electric Cooperative, Garberville, Calif.; $120,000 to the Lost River Electric Cooperative, Arco, Idaho; $15,000 to the Yellowstone Valley Electric Coop, Huntley, Montana; $370,000 to the Kit Carson Electric Coop, Taos, New Mexico; $45,000 to the San Isabel Electric Assn., Pueblo, Colo.; $37,000 to Columbia County Rural Electric Assn., Dayton, Wash.

## EQUIPMENT COST

2000 Kv-a., 13,800/4160 Volt
OPEN-TYPE SUBSTATION



2000 Kv-a., 13,800/4160 Volt
CSP TRANSFORMER

3—Single-Phase Power Transformers
1—Three-Phase Regulator
Metering, auxiliary transformers and switching equipment
Protective devices
Numerous other miscellaneous items

Everything complete in one unit

Steel structure

No overhead structure required

TOTAL COST

$15,062 | $14,458

PLUS
Extra cost for added ground space required

PLUS
Time required to erect structure and assemble many separate items

*Saving in cost...at least $604.00 plus*

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**CSP's**

A CSP Power Transformer performs all the functions of a conventional single-circuit substation . . . better . . . at less cost. For a given capacity and voltage rating, it will save up to 6% PLUS a substantial reduction in installation expense. Contractors have estimated this last saving as high as $1500.00.

CSP Light-duty Power Transformers meet the problems of present war conditions: they require less space, less man power and less critical materials to install. And if, or when, a load center shifts as many probably will after the war . . . the CSP Transformer can be shifted easily with it . . . 100% salvage.

Get full information on CSP Transformers to meet your requirements. See your Westinghouse representative or write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

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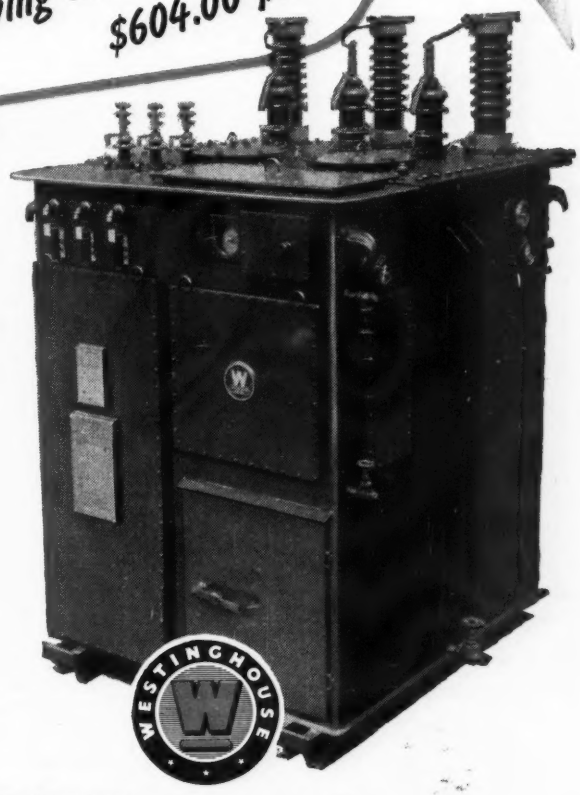


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get the nod.

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The all steel construction makes the anchor practically unbreakable. There is no chance for expanding arms to jump off because they are clamped on securely. The blades will not side twist during expansion, but must remain at right angles to each other, thus equalizing the strain at all points. The nut retainer, as shown below, prevents this anchor from riding up the rod during installation and permits salvaging the rod in case the anchor is to be abandoned. It is also possible to drive the rod through this retainer in case both anchor and rod are to be left in the ground.

Consult your Chance Catalog of Pole Line Equipment or ask your jobber.

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## POWER RESOURCES WILL BE INVENTORIED

An imposing opus now in preparation will inventory all electric power resources of Colorado, Wyoming, western Nebraska and northern New Mexico; will, furthermore, estimate the area's possibilities for development on a basis of present and potential installations.

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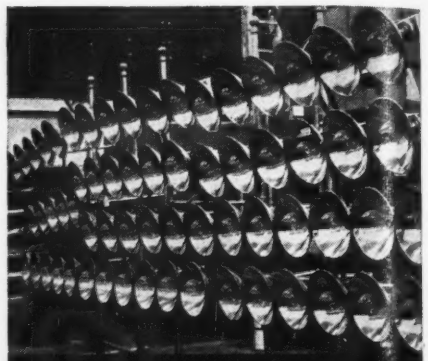
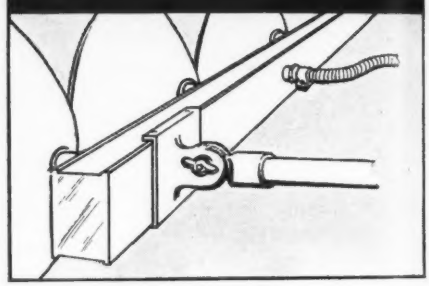


SIMPLIFIED INFRA-RED INSTALLATION WITH WIREMOLD SYSTEM-WIRING



● Use of Wiremold Channel and Fittings permits compact and efficient grouping of lamp units with ample structural strength, easy adjustability and a simple, adequately protected method of wiring. Illustrations above show a typical bank of infra-red heating lamps and the manner in which they are installed on Wiremold No. 3000 Channel, using conventional type sign receptacles. Detailed drawing shows method of supporting channels by means of Wiremold No. 3008F adjustable hanger fittings, also cable feed connection through K. O. in back of channel.

For further details of fittings and installation send for new Engineering Data Sheets covering applications of this type.

The Wiremold Company
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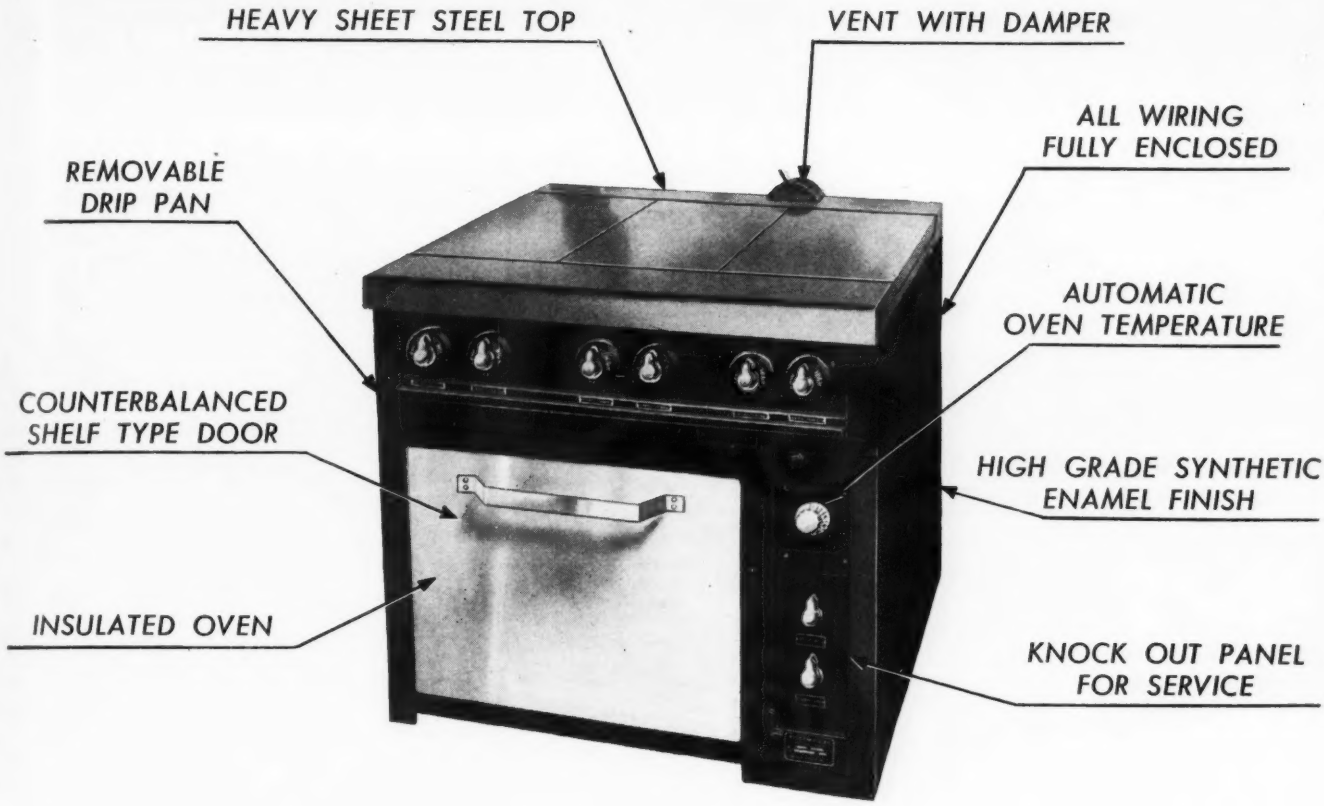


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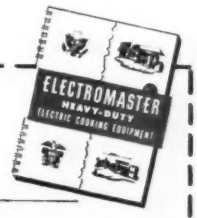


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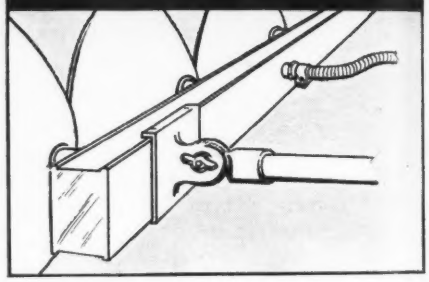

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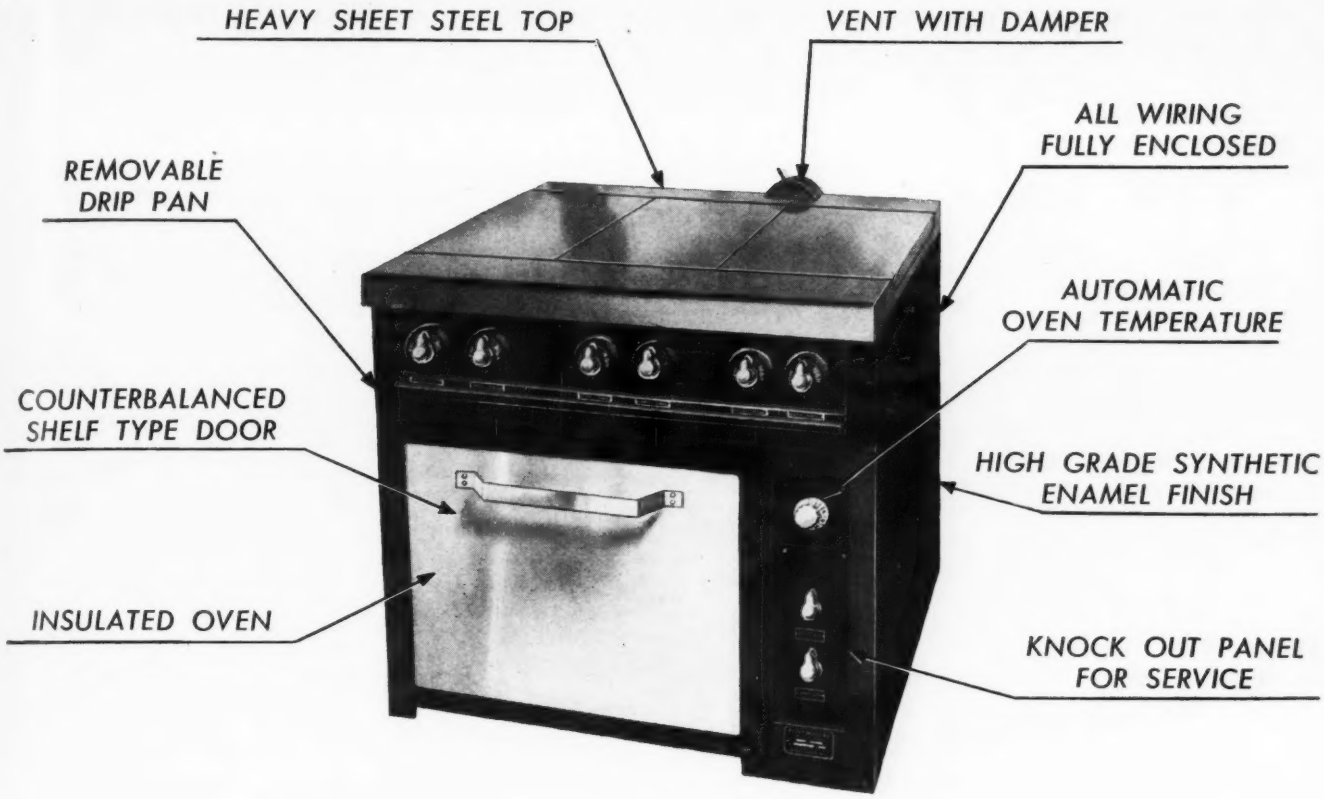


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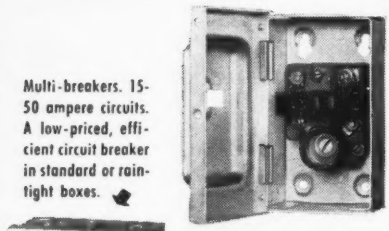
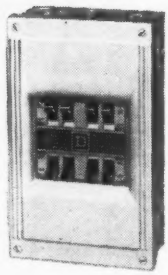
Electrical contractors will find a ready farm market for a variety of devices and the installation work which goes with them. The farmer, the Department of Agriculture county agent, and the contractor make a good trio in getting much needed rural electrical improvements under way.

Class 9013 Pressure Switch for deep well pumps. Heavy duty, 2 H. P., 110 volts.

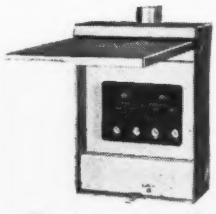


Multi-breakers. 15-50 ampere circuits. A low-priced, efficient circuit breaker in standard or raintight boxes.

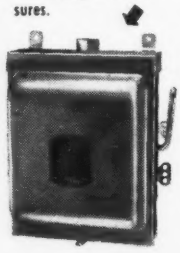




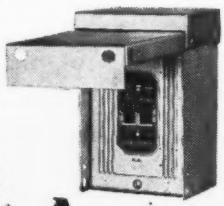
Blue Label Switches. Small and compact. For 30 and 60 ampere, 230 Volts A. C. applications.



Entrance switches with range and lighting circuits. Pull-out mains. Standard or raintight boxes.



Type C and D Safety Switches in standard or raintight enclosures.



MO Multi-breakers. 15 to 25 amperes, single or double pole. Raintight or standard enclosures.

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## LEGAL QUESTIONS ARISE IN IMPERIAL STRIKE

Question whether employees of a state or political district come under the provisions of the Wagner Labor Relations Act and therefore can strike was placed before Governor Warren of California when the dispute over bargaining agency selection between the Imperial Irrigation District and the local union B447, International Brotherhood of Electrical Workers reached a strike threat stage in mid-November. The dispute arose when the IBEW union claimed a majority of electrical employees as members and asked for appointment as official bargaining agency for them under the Wagner Act.

In a letter to the WLB, the LRB and Secretary of Labor the IBEW manager, C. D. Downs, claimed that representatives had been refused a hearing, and asked for a secret strike ballot. Harry W. Horton, chief counsel for the district had rendered an opinion interpreting Section 152, Title 29, of the Act as exempting a political subdivision from the meaning of an "employer". To this the IBEW threatened a strike outright but on appeal from acting Governor Fred F. Houser, the matter was deferred until the Governor returned. Governor Warren held the strike to be "against the government in the sense that the district is an arm of government as well as that the services it renders through its operations are vital to the war effort."

The IBEW then called a strike Nov. 27 and placed pickets around district headquarters. About 125 employees refused to cross picket lines. Of these, 60 union members were discharged for disobeying the district's orders. Of 55 others who stayed off, 42 were reported to have returned to work and the others were to be discharged if they did not. About 200 ranchers were deputized, according to reports, to guard the district property and operate it if necessary. There was no disorder. The union is appealing to the Department of Labor.

● PHOENIX CITY COMMISSION was presented a report by the Citizens Good Government Council at the beginning of last month suggesting as a worthy postwar program extensive changes in the city's street lighting and paving as means to reduce traffic accidents. It asked for cessation of the practice of installing street lights of low mounting height, conversion to higher mountings, modern luminaires, use of larger lamps, and suspension nearer the center of streets. It recommended a five-year program of changeover.

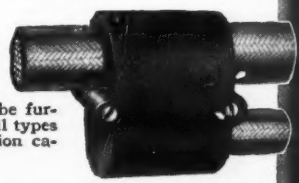
● SALT LAKE CITY'S traffic signal system will be modernized under a $14,500 contract awarded last month to the Strand Electric Service Co. The state is financing the project, since the city maintains signals on state highways through the city. Modernization will include uniformity in semaphore colors on city and highway streets, eliminating sequences claimed to be in violation of the state traffic code. Signal lights will be synchronized to allow free movement of traffic.

With valves borrowed from Boulder Dam, USBR is continuing construction of Friant Dam in California, stopped by WPB's order to cease manufacture of control equipment. The dam will store water for irrigation of the San Joaquin Valley. No power will be generated in connection with this project

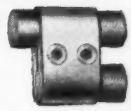
*from the* MOST COMPLETE line of Cable Taps

Now you can select from a really *complete* line of standard and special taps. Every one carefully designed and manufactured.

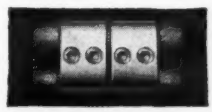
Parallel and 90° taps — and combinations — in the widest variety. For conductor sizes up to 1,000,000 CM.



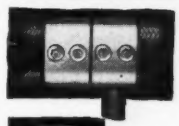
Gutter Tap with Bakelite Cover. Insulating covers can be furnished for all types of Penn-Union cable taps.



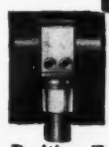
2-way Gutter Tap. Main and branch sizes 8 to 1,000,000.



Two Separate Parallel Taps to a continuous main conductor.



Combination Cable Taps; one branch parallel to main, and one at 90°.



Hinged Clamp of Penn-Union Type HFM makes installation easy. Multi-slit tapered sleeve assures permanent grip on branch.

Positive Equalized Pressure on main and branch, with Penn-Union Type SM. Tightening torque is accurate measure of the clamping force.

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Specify scattered transformers to eliminate duplicate conduit runs and save on power costs.

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ALL the strength and durability inherent in steel are combined---with definite economies---in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

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INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

## ARIZONA EDISON ASKS REBATE ON TAXES

Seeking recovery of $4,626 in taxes, the Arizona Edison Co. has filed suit in superior court at Yuma against the county, its treasurer and the Arizona State Tax Commission. The company has charged inequitable assessed property valuation and miscalculation in a levy for welfare purposes.

Arbitrary increase in assessed valuation of electric, gas and water plants from $470,420 to $670,420 was made without proper hearing and sufficient legal notice, the company claims in protesting the first installment of $2,681.49.

The utility also contends that the county and state has no right to collect $1,944.68 for partial support of the state board of social security and welfare, charging that the tax commission failed to take into account revenue derived for welfare purposes from the sales tax.

## Christmas Lights Out, But No Power Shortage

Although Denver will not have its customary elaborate outdoor Christmas lighting this year, the economy is not due to any shortage of electric power. This assurance was given by H. M. Sharp, national president of the Illuminating Engineering Society following studies of Rocky Mountain power resources, made during his recent visit to the West. Lack of manpower and equipment make the conservation advisable, not lack of power, he stated.

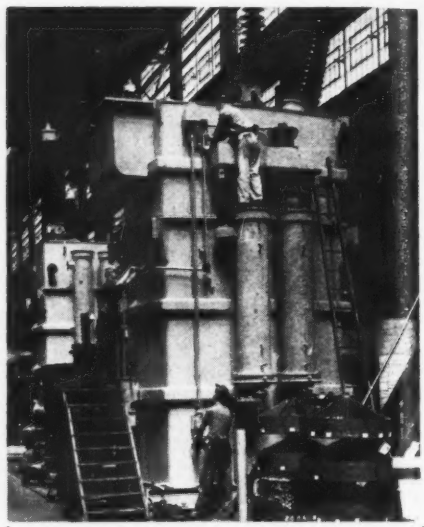
"Christmas lighting economy," Sharp declared, "is in consonance with the expressed desires of J. A. Krug, director of the WPB War Utilities Division. However, due to the great number of small lamps used for Christmas lighting, the output and consumption of electricity for Yuletide purposes has never been a big factor." He urged all citizens to keep alive the spirit of the season by employing modest interior decorative lighting effects.

## City Retains Shields on Ornamental Street Lights

To cover cost of removing dimout shields from street lights in Seattle's residential areas, the city council has appropriated $8,700 of City Light funds.

The dimout shields will not be removed from lamps on ornamental street lighting systems in the downtown and community business districts at this time, because they might later be ordered put back by military authorities in case of emergency.

Superintendent of City Light E. R. Hoffman advised the city council that H. P. Everest, director of OCD's Northwest sector, has warned that ornamental street lighting systems are principal factors causing "sky glow and beacon effect from city areas".



This 26,000-kva. transformer, being built for installation at Grand Coulee Dam, is rated 230/13.6 kv. single phase, 60 cycles.

● DESPITE cancellation of dimout regulations in British Columbia shields for ornamental street lights nevertheless are to be provided, W. D. Greyell, chairman of the civic utilities committee announced. Use of shields throws between 10 to 15% more illumination on the streets than comes from open globes. City Electrician L. H. Miller has been asked to make a survey of the whole city with a view to making recommendations to the city council for certain areas. Better illumination is desired, Alderman Greyell stated, to reduce crime and improve visibility during the foggy season.

● LIGHT CONTROL DEPUTIES of San Francisco's Office of Civilian Defense, headed by A. O. Olson, manager of utilities, San Francisco, met at Olson's home, Nov. 18, to consider whether to disband in view of dimout lifting or to stay organized. Cooperation in the possible program of test blackouts contemplated for the future was decided as reason for keeping the organization intact. It had worked as a lighting advisory staff to the air raid warden service in enforcing the dimout regulations. The staff is made up of lighting men from the electrical industry.

# Build Your LOW-VOLTAGE LINES "For Keeps"

**VOLTAGE of a line doesn't make much difference when trouble develops. It still requires use of emergency equipment, men, materials, and loss of time; all scarce articles today. You can well afford to build low-voltage lines "for keeps". This is no time to invite unnecessary service calls.**

**Good strain clamps--O-B Universals--will do their share in such a program. They are designed by the same transmission engineers who have established most of the basic principles in modern suspension and strain hardware. They are made in the same plants, to the same standards, as all other O-B transmission devices. They are built to do a specific job by men who understand that job. Universal Strain Clamps are no mere side-line or tonnage item to O-B. They are carefully designed to do a job and do it well. Let us show you how.**

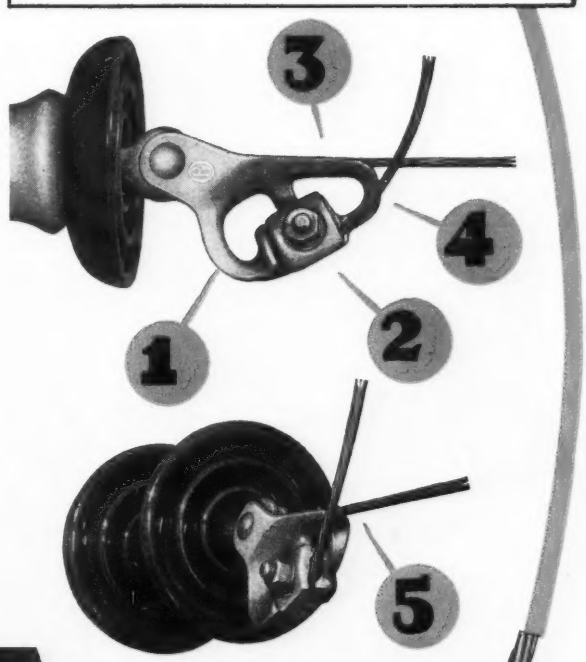
★

Cable is held solidly by the double action of a snubbing principle (1), and a powerful clamp (2). Universal Strain Clamps will develop a slip strength in excess of 90 per cent of the ultimate of cables with which they are used. Cable is not cut or sharply bent. Clamp may be loosened for re-location of cable, or completely removed for re-use.

No sharp line of demarcation exists between gripped and ungripped cable--a frequent cause for fatigue failure. Approach to clamp (3) tapers off the grip and removes all danger of cable damage.

A convenient point is available to hook a pulley block at (4). Clamp is pulled in straight position. Tension is not lost when falls are eased off.

Because wind and vibration cause some movement of the jumper section of the cable, Universal Strain Clamps are designed to keep cable from touching itself or rubbing where it crosses (5).

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CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

O-B Baby Universal Strain Clamp, Catatog Number 80500. Accommodates cables .125 to .350-inches. Ultimate strength, 8,000 pounds. Two other Universals, the Intermediate and Large size, are available for still heavier service.

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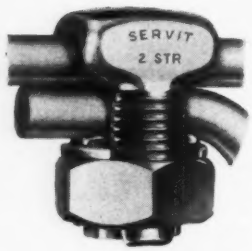


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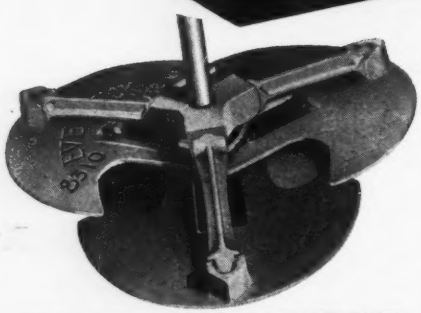

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J. E. Beggs, 1206 E. 61st St., Seattle, Washington

## WPB OFFICIAL REFUTES POWER SHORTAGE CLAIM

Present surplus of electric generating capacity in the Northwest is at least 200,000 kw., according to a recent statement by a WPB official. The statement was in refutation of testimony by Homer D. Angell, Republican congressman from Oregon, that the Northwest is short of power.

Not only is there no shortage of power extant or in prospect for the Northwest, the WPB spokesman said, but a surplus of 300,000 kw. is anticipated for the region by the end of 1944. Proportionately to demand, he added, the existing surplus in the Northwest is greater than that in any other section of the United States. He explained that a local "tight" situation in Utah is "only temporary."

Angell made and reiterated his statement in testimony before the House Rivers and Harbors Committee when speaking in support of the Snake River and Umatilla Dam projects which the committee later approved.

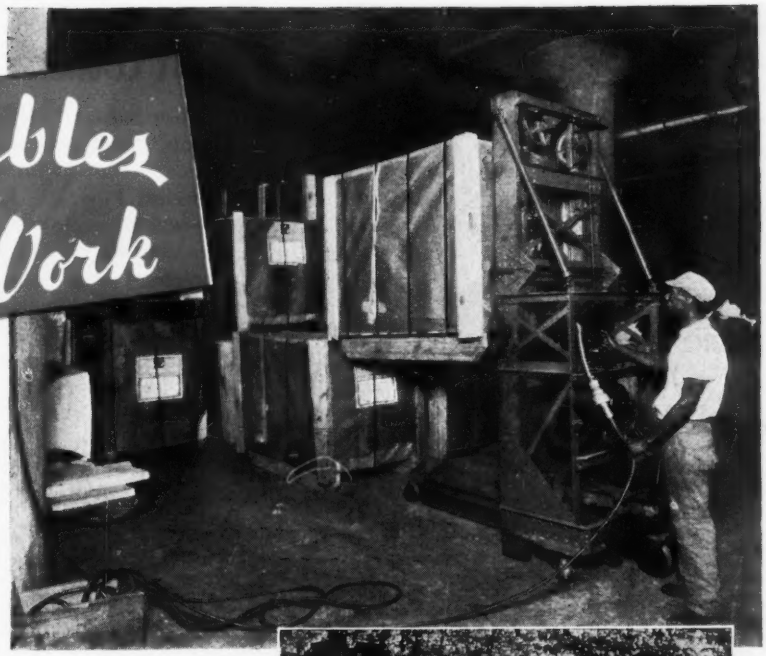
While the WPB spokesman declared that there is "nothing to change my opinion that we will end the war with a large surplus of power capacity in the Northwest," another WPB official added that:

"It does not seem likely that the aggregate of all new industrial loads in the Northwest would take any substantial portion of the surplus in view of the manpower situation in that area."

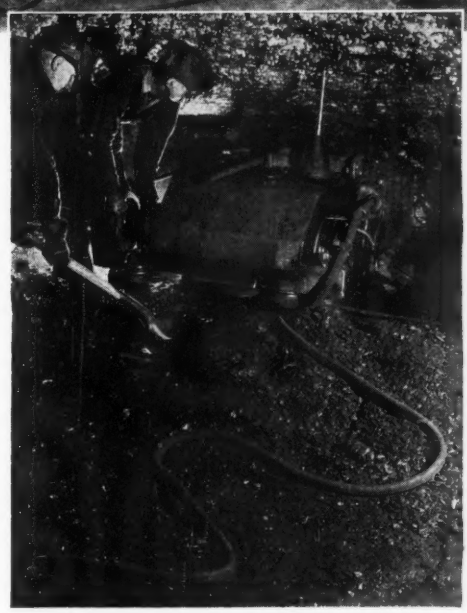
He added that some new capacity might be installed in local areas close to load centers where it might become needed to correct long-distance transmission difficulties, and explained that the fuel situation might make some additional hydro capacity necessary in the Northwest "strictly as a fuel conservation measure."

The Umatilla project, on the Columbia River west of Wallula, Wash., would open the river to all-season navigation as far inland as Pasco, Wash., some 300 miles from the Pacific. The Snake River project would entail four dams between Pasco and Lewiston, Idaho, permitting navigation to Lewiston. Umatilla, regarded as the next step in Columbia River development, would have an ultimate installed generating capacity of 500,000 kw. The lower three Snake River dams would have 155,000 kw. of generating capacity. First installation at Umatilla is proposed to total 385,000 kw. in the form of 11 generators of 35,000-kw. capacity each.

# Trailing Cables FOR Vital WAR Work



TIREX - rubber sheathed - cables were designed for hard, rough work. They still have remarkable wearing qualities and abrasion resistance and can be depended upon for continuous, dependable performance but, for the duration of the war, they meet restrictions governing the use of rubber, copper and other scarce materials.



It is important, now more than ever before, to get maximum service from trailing cables upon which portable or mobile electrical equipment depends for current. New cables are hard to get and those already in service must be used until they are completely worn out. To this end we make four suggestions.

1. As far as possible use the proper size and type of cable for the work to be done.
2. Provide extra protection or change location where exposure is hazardous.
3. Inspect cables frequently and regularly to discover conditions that may cause trouble.
4. Make repairs promptly when needed.

If you must have new cables for vital war work we shall be pleased to do anything we can, consistent with conservation restrictions, to help you get what you need.

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41 Post Office Place Salt Lake City, Utah

## UTILITY FRANCHISE DEBATED BY COUNCIL

A resolution before the Seattle City Council would put the present city administration on record against renewal of Puget Sound Power & Light Co.'s franchise when it expires in 1952. Intention is to develop the City Light distribution system to a point where it can carry the entire electric load.

Reportedly the general sentiment of the council is that the measure should be voted on by the people of Seattle before the council takes binding action. Councilmen also pointed out that council action would not be binding on future administrations, but stated that it would commit the present body to a large City Light expansion program within the next ten years.

## Procedure Simplified On Essential Utility Projects

A move to eliminate considerable duplication of effort in determining which utility projects are necessary to the war effort has been agreed upon by the Office of War Utilities, the Federal Works Agency, the Federal Security Agency and the President. OWU will not lose its jurisdiction over determination and allocation of supply, materials and equipment through the agreement.

The program resulted principally from the assignment of OWU water division engineers to check data already gathered by FWA. Under the new plan, FWA determines which projects shall be sent to the President for a determination of essentiality to the war effort, after projects have been drawn up by FSA and FWA.

In spite of reports that WPB would be called upon merely to assign priorities to those projects found essential and that it would be bypassed in the matter of determining essentiality, OWU officials were notified that:

"You appreciate, of course, that nothing in this statement of plans and procedures is intended in any way to impair the responsibility of . . . (any) division for determining over-all . . . supply and requirements and over-all materials and equipment requirements and for taking all necessary actions in order to make such determinations and to allocate available materials and equipment.

"As in the past, the OWU will continue to determine (a) availability of materials and equipment for FWA projects; (b) relative essentiality as between projects submitted by FWA and other . . . projects either of FWA or other agencies; and (c) to what, if any, extent the submitted project should be modified for the purpose of conserving materials and equipment for assuring adequate (utility) supply for the war program."

The President had asked FWA, FSA and the Budget Director to submit a program to be followed in carrying out a community facilities program under the Lanham Act of 1940.

# TRADE *notes*

● EARL S. CONDON CO. has been formed to take over the business of Condon & Young, Los Angeles manufacturer's representative. Robert A. Young has entered the Navy as lieutenant (s.g.). Located at 357 S. Hill St., the company represents the wire and cable division of U. S. Rubber Co., Lapp Insulator, Burndy Engineering and Cole Electric companies.

● THREE well-known electrical contracting firms have joined together to do wiring of ships on a subcontract basis. These are Kenney Electric Co., San Francisco; Charles A. Langlais Co., San Francisco; Fischbach Co., New York City and Harry L. Moore, Los Angeles. Firm name is Fischbach, Moore, Kenney & Langlais Richmond Co.

● LISTENWALTER & GOUGH, INC., Los Angeles appliance distributor, has been appointed to distribute L & H electric ranges and water heaters in the southern California area, according to announcement of A. J. Lindemann & Hoverson Co. of Milwaukee, manufacturers.

● CROWN ELECTRIC CO., at 447 Stevenson St., an old San Francisco electrical contracting firm, has been taken over by M. F. McEnany. Until he joined the Sea Bees, it was run by Robert Griffin, now a lieutenant commander.

● DUNCAN ELECTRIC MFG. CO. has moved its Los Angeles office and meter warehouse to 164 S. Central Ave., it was announced last month by A. F. Blecksmith, district manager.

● HYGRADE PHONOGRAPHS LTD., Vancouver, B. C., has made application for change of name of its firm to Electronic Products Co. Ltd.

# PEOPLE
*made this news*

## Loiseau Named To Head Colorado Public Service

John E. Loiseau became president of Public Service Co. of Colorado last month in reorganization proceedings in connection with transfer of common stock holdings from Cities Service Power & Light to private investors (see p. 76). Guy W. Faller, former president, was named chairman of the company's board of directors.

A 20-year employee of the company and its predecessors, Loiseau steps up from the position of vice-president and secretary. His career has a Horatio Alger flavor. He was born in South Dakota in 1891, moved with his parents to Missouri and at 16 years of age went to work as salesman for a Perryville, Mo., mercantile firm. At 20, he became a clerk for the Missouri Pacific railroad, then was successively stenographer for the Butler Co. at Poplar Bluffs, and secretary to the president of a car manufacturing company in Illinois.

He entered the utility field in 1915, when he joined the group of electric, gas and traction companies owned by the Henry L. Doherty interests. He was first in charge of accountancy for the Citizens Gas, Electric & Heating Co. of Mt. Vernon, Ill., then went with the Mansfield Electric Light & Power Co. at Mansfield, Ohio, as secretary. From 1920 to 1923, he was secretary of the Montgomery Light & Water Power Co., at Montgomery, Ala. In 1923 he joined the Denver Gas & Electric Light Co., predecessor of the Public Service Co. of Colorado, as its secretary.

● RAY W. TURNBULL, Hotpoint executive vice-president and well known on the Pacific Coast, was elected president of the appliance company on Oct. 28. Turnbull started with the original Hotpoint company in 1910 shortly after its foundation. From helper in the foundry, he progressed through the factory assembly lines to order service, advertising and eventually to the post of sales manager. He was made vice-president in 1931 and executive vice-president in 1940.

● EARL WILSON, former electrical contractor at Napa, Calif., has become electrical inspector for that city. Wilson, a pioneer electrical contractor in the region, closed his wiring business and turned over the radio repair business to one of his employees.

*Putting 'em Thru the Mill!*

Strip for Action! Strip made from WILBUR B. DRIVER CO. special alloys! Strip that has so many essential war uses! As it is rolled through their mills, day and night, we know it will do its part in flattening the Axis!

Consult us for your special alloy requirements in rod, wire, ribbon and strip—both hot and cold rolled.

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**NON-STOP PRODUCTION with**

**TRICO OILERS**

No need to stop production to oil machines — no bearing failures due to lack of oil—no waste. Modernize your machines and conserve critical materials, manpower, and increase production. INSTALL TRICO AUTOMATIC OILERS!

**TRICO KLIPLOKS**

That jack-screw pressure literally bolts fuses and clips together!

KLIPLOKS ELIMINATE:

- Unnecessary shut-downs.
- Premature fuse blowings.
- Night and holiday repairs.
- Burnt fuses and clips.
- Wasted current.

Use KLIPLOKS everywhere. They create immediate results and pay for themselves quickly.

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There is no such thing as "banking hours" with a Mailway account. You can open one by mail (checking or savings) and conduct it entirely by mail — right from your home or office to suit your own convenience. Our special Mailway envelopes and passbook make this service fast and safe.

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*We have been making safety tools for 26 years*
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NOW—lower prices and higher capacities

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**ANGUS-CAMPBELL, INC.**

## Los Angeles Appoints Top Executives in New Set-up

Appointment of top executives to assist H. A. Van Norman, recently named head of the consolidated water and power bureaus, has been announced by the Los Angeles Department of Water and Power.

R. R. Robertson has been named chief electrical engineer and deputy general manager. He will be assisted by Charles P. Garman.

In the new set-up H. C. Gardett will serve as consulting engineer to the power system. Gardett retired on Oct. 31 as chief electrical engineer and general manager of the Bureau of Power & Light, following 35 years with the city. Although he reached the retirement age under the department program several months ago, he was continued in his position by special action of the board.

VAN NORMAN

Robertson has been associated with the municipal power bureau for 31 years. As engineer of construction since 1928 and as engineer of design and construction since 1940, he has directed many major projects, such as the transmission lines from Boulder Dam and the new Harbor Steam Plant.

Garman joined the power bureau staff in 1920. He has been engineer of design in the design and construction division, handling receiving and distributing stations, power plants and general structures.

● D. B. AMBLER, engineer for the Central Lincoln PUD in Oregon has been named acting general manager pending selection of a manager to succeed C. A. Woodham, resigned. Wood-

ROBERTSON

ham had been manager since the PUD took over properties of West Coast Power Co. in May.

● Ernest Charles Youman, 62, employee of Pacific Gas and Electric Co. since 1907, died in November following an illness of several months. He was foreman of electric and utilities at PG and E's Emeryville, Calif., central supply warehouse, having been transferred there from Sacramento when the warehouse was opened in January 1926.

● I. W. Alexander, who for many years was manager of the securities department for the San Joaquin Light & Power Corp., and later San Joaquin Valley manager for the investment firm of Blyth & Co., died Nov. 19 in San Francisco.

● Harold John "Jeff" Cunningham, partner in the British Columbia Sound and Radio Service, Victoria, died at Royal Jubilee Hospital in that city. He was one of the pioneers in sound systems and public address systems on Vancouver Island.

● H. A. Crossland, at one time Western regional sales manager for General Electric's receiver division, has been named manager of sales for that division of the Electronic department. Crossland was transferred to Schenectady from San Francisco in June 1942, following two years on the Pacific Coast. In his new position, he will divide his time between Bridgeport and Schenectady.

GARMAN

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**CHICAGO OFFICE**

**and sales representation in all or any part of**

***Ill., Ind., Mich., Minn., Wisc., W. Ohio***

**would appreciate opportunity of negotiating with you. Priority or non-priority business. Commission basis.**

**The Pierre L. Miles Co.**

**20 No. Wacker Drive Chicago 6, Ill.**

**ARE YOU PAYING FOR UNUSED POWER ?**

**Improper brushes burn up costly electric power . . . are likely to damage valuable equipment. Although an inconspicuous part of the great majority of electric motors and generators, properly designed brushes are indispensable to their efficient operation.**

**UNITED STATES GRAPHITE BRUSHES provide the greatest possible insurance of uninterrupted service in your electrical installations. These brushes are based on U.S.G. competence in brush engineering, and uniform high quality of raw material and finished product.**

**MARWOOD warehouses carry nearly a thousand different industrial and F.H.P. Brushes in stock, and Marwood Production Technicians are ready to help you select the U.S.G. Brushes which best suit your requirements.**

**MARWOOD LIMITED**

**Pacific Coast Agents for United States Graphite Company**

**Seattle Portland San Francisco Los Angeles**

☆

No. 758

## Puget Sound Announces Personnel Changes

Personnel changes following severance of its ties with Engineers Public Service Co. were announced by Puget Sound Power & Light Co. in November.

Henry R. Kruse became manager of the newly created economic development and research department, with George L. Rideout, former assistant to the personnel director, as his assistant. Dr. George W. Allison, until recently with the Edison Electric Institute, is another member of the new department, which is headquartered at Seattle.

John F. Wallin was moved up into Kruse's former position as northern division manager, with headquarters at Bellingham, Wash. He had been assistant to the manager of the central

WALLIN

division including Seattle and King County.

J. Harvey Leach, advertising director since 1936, has been transferred to Bremerton as western division manager. The former manager of this division, L. J. Bourke, has been made a member of the executive department at Seattle, with the title of depreciation engineer.

Kruse has been with Puget Power since graduation from the University of Washington in 1923. He has served in every operating division of the company in positions ranging from meter reader to executive posts in the general office. The new department which he heads will be devoted to providing maximum usefulness to the company's customers under wartime conditions and to meeting postwar needs of its customers as changed conditions may dictate.

● ERIC JOHNSTON, Spokane electrical manufacturer and president of the United States Chamber of Commerce, will speak in San Francisco Dec. 15 at a Victory rally sponsored by the Northern California Electrical Bureau, the Electric clubs of San Francisco and Oakland and the Gas Appliance Society of California. R. E. Fisher, Pacific Gas and Electric Co. vice-president, is heading the activity. Johnston's topic will be the *Challenge of Change.*

● MELVIN G. ARNOLD, advertising manager, Portland General Electric Co., has been on leave of absence from the company since Nov. 15, to accept a

LEACH

position on the government committee for congested production areas. He is acting as assistant area representative for this committee, with headquarters in Portland. The committee, which is composed of representatives of WPB, WMC, Director of the Budget and other government agencies, functions directly under the executive office of the president to coordinate manpower and materials for the war program.

● THREE G-E OFFICIALS visited the Pacific Coast last month to confer on war and postwar problems. D. C. Prince, vice-president in charge of application engineering, Schenectady, took part in discussions of industrial problems which will follow the war. H. V. Erben, manager of the company's Central Station divisions at Schenectady, inspected the larger war plants. L. H. Taylor, head of the Appliance and Merchandising department's product service division at Bridgeport, Conn., was on a survey of the company's Pacific Coast service operations.

## Idaho Power Advances Three Officials

Idaho Power Co. recently announced the advancement of three of its personnel.

A. C. Inman has been named vice-president and will continue his duties as secretary and director.

J. H. Rogers succeeds the late Robert W. Miller as treasurer of the company. Rogers has been comptroller

KRUSE

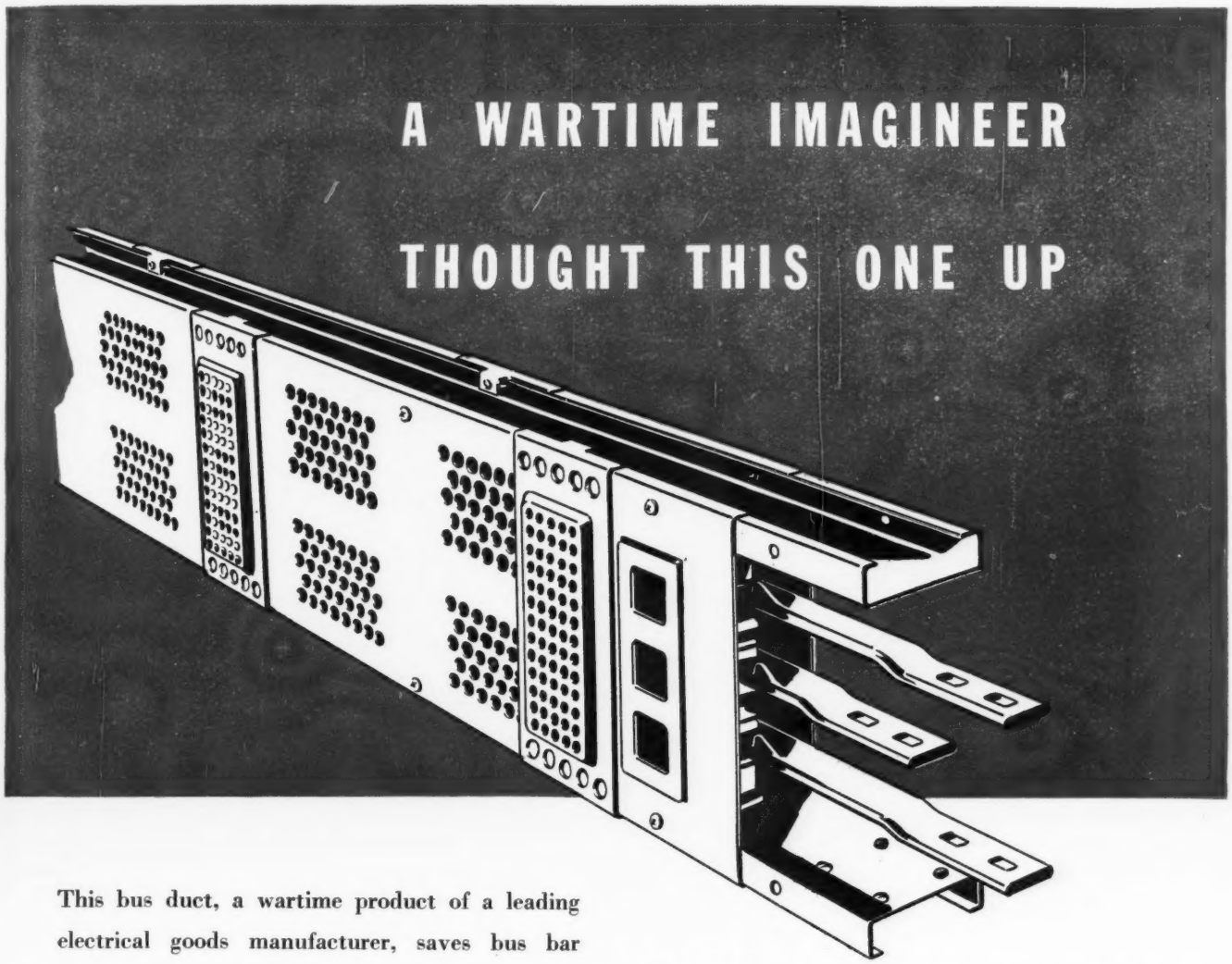
since 1940 and will continue in that office.

E. A. Andersen has been appointed assistant secretary.

● WALTER W. R. MAY, for the past six years director of public relations and industrial development for Portland General Electric Co., will leave that company Jan. 1 to publish the *Oregon City Enterprise,* which he has recently acquired. In this move May returns to a former occupation. He was managing editor of the Portland *Oregonian* from 1928 to 1933 and had had previous newspaper experience. In 1933 he was drafted by Portland business men to manage the Portland Chamber of Commerce at the time the Bonneville project was being promoted and built. In 1938 the Portland General Electric Co. sought his services to assist in securing new industrial loads which would make intelligent use of Bonneville power.

● WESTERNERS attending Westinghouse company's recent conference on electronic developments at East Pittsburg included A. A. Bulen, Seattle; R. Bollaert, San Francisco; E. W. Morris, Los Angeles, and R. T. Barnum, Denver.

# A WARTIME IMAGINEER THOUGHT THIS ONE UP



This bus duct, a wartime product of a leading electrical goods manufacturer, saves bus bar material by permitting heat to be dissipated faster; smaller bus cross sections can be employed for equal ratings. And it saves on the housing material by using perforated metal instead of solid sheet.

This is an excellent example of what we mean by *Imagineering*. Some engineer departed from standard channels of thinking, and produced a "substitute" which may have its effect on future construction.

Now, when postwar designers say, "Make both the bus bar and the housing of Alcoa Aluminum," that will be plain, good *Engineering*. The weight savings effected by building with aluminum means less burden to be carried by supports. Aluminum bus bars have ample current-carrying capacity and aluminum housings provide additional electrical advantages.

Prewar power lines of A.C.S.R., Alcoa Aluminum bus bars and housings, are serving thousands of war industries—visible evidence that it pays to Imagineer with aluminum. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Bldg., Pittsburgh, Penna.

IMAGINEERING AT WORK

ALCOA ALUMINUM

ALCOA A·C·S·R

ALUMINUM CABLE STEEL REINFORCED

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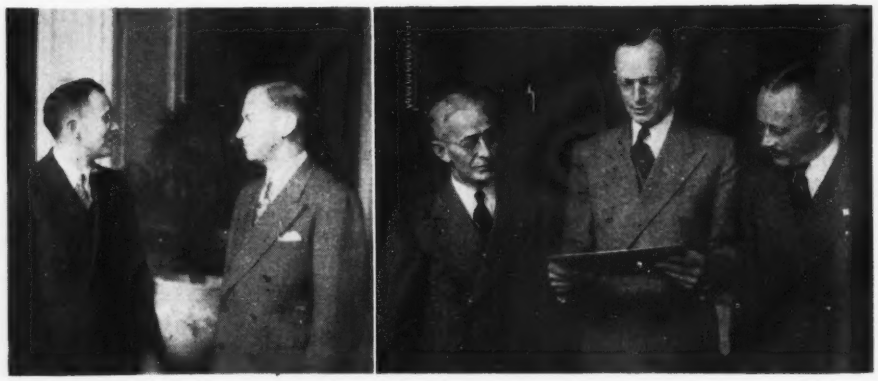
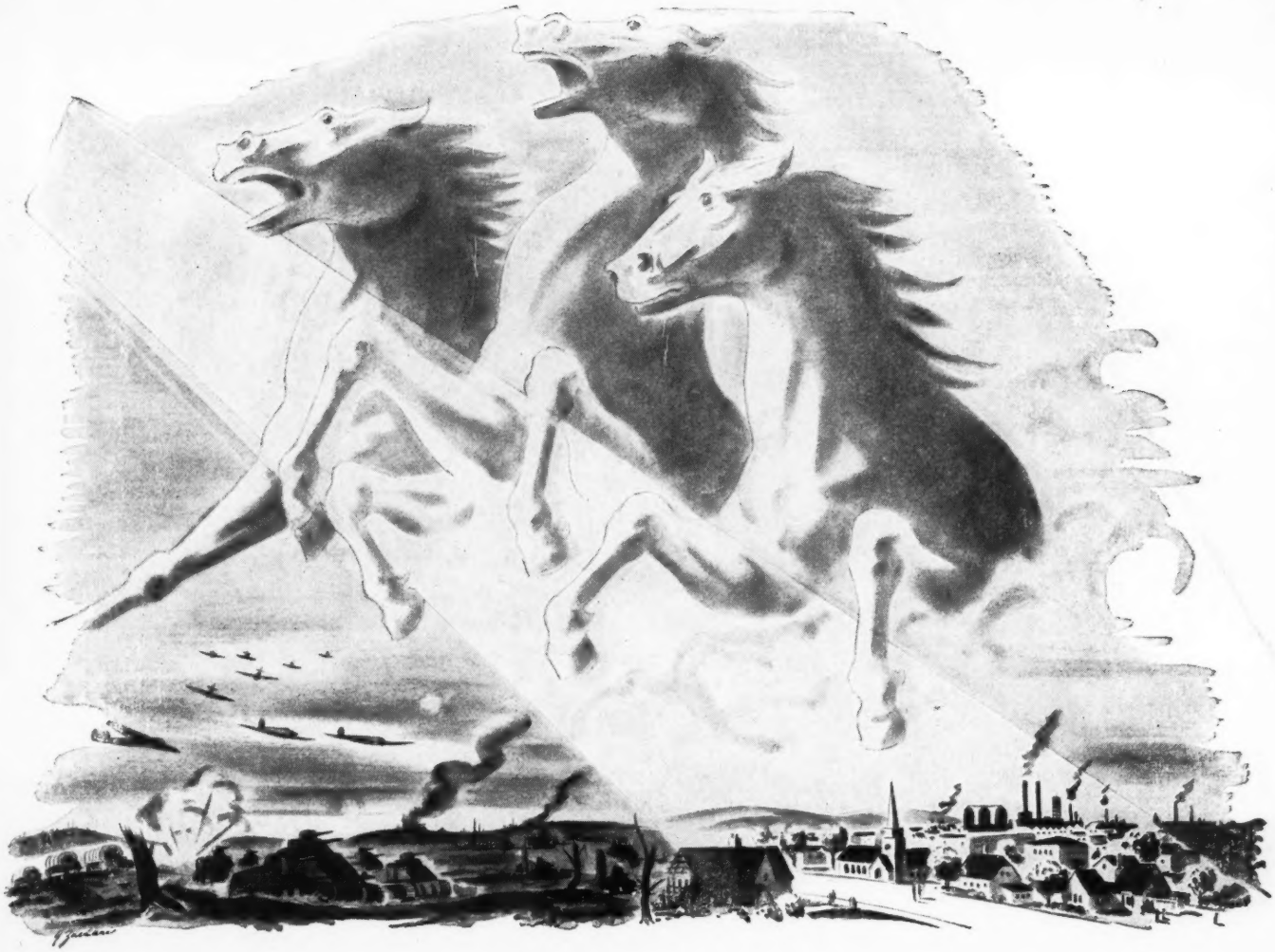
# PROFILES *of the month*

John A. Duncan, Los Angeles manager of Westinghouse Supply Co.'s appliance and supply department, retired in October, after 12 years in that position, 16 with the company. Duncan's first job was troubleshooter for the telephone company at Crawfordsville, Ind., where he attended Wabash College. He left in 1898 and, following a couple of years with the U. S. Signal Corps, went to work for the Home Telephone Co. at Fort Wayne, Ind., as superintendent of equipment. Five years later he entered the construction field, building automatic telephone plants in Iowa and Nebraska. From 1907 to 1927, he was with Illinois Electric Co. at Des Moines and Chicago, eventually becoming vice-president. He joined Westinghouse Supply at Chicago in 1927, went to the New York radio department three years later, then transferred to West Coast



Pictured at the PCEA conference in Los Angeles (left to right): A. F. Ayres, Calif. Electric Power; Charles T. Malloy, So. Calif. Edison; W. E. Row, So. Calif. Edison; Ralph Hopkins, Westinghouse; A. A. Kroneberg, So. Calif. Edison

Heading the Electrical Maintenance Engineers of Northern California are Art Cazin, of Otis Elevator Co., (standing) president; and John Hayes, American Can Co., (seated) secretary-treasurer of the group. Difficulty to find both eating and meeting place has been solved by loan of a conference classroom by Pacific Gas and Electric. Across the street is a lunch stand.



# HORSEPOWER

## FOR VICTORY... AND PEACE

ELECTRIC POWER is doing a magnificent job. It is driving the machines, the tools and instruments that are producing ships, planes, munitions and supplies for our fighting forces all over the world.

Supply of Electricity is adequate. Far-sighted planning, begun several years before Pearl Harbor, has kept our generating capacity always ahead of the increasing power demand of the war industries and the needs of a population that has grown by hundreds of thousands. Pacific Gas and Electric Company today is serving electricity to more than one million customers. More than 50 per cent of its total generating capacity of 2,100,000 horsepower now is devoted to the "'round the clock" operations of our war industries and military establishments.

*Horsepower for Victory! And Horsepower for Peace when Victory has been won!*

When that day comes Electric Power will be available in abundance for the great tasks that lie ahead—the return of industrial California to peacetime production—the building of super highways to provide adequate transportation facilities—construction of new homes and buildings—manufacture of autos and trucks—restocking of the shelves of commerce with appliances and goods.

*It will be a big job. Electric Power will be ready.*

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# *Adequate Wiring is Important!*

When the chips are down and orders are to "go in and take that beach"—every part of these unique landing craft must function perfectly.

Think of the millions of men who have been exposed to the magic of machinery and electricity in ships, in planes, in every type of fighting equipment, and how much they will expect of electricity when the war is over and they are in their homes again.

Be ready for this new type of customer by keeping up with your trade magazines; by knowing what the market offers in wiring devices as well as appliances—and the **reasons** therefore. If you need any particular information, visit or write your Association in Los Angeles or San Francisco.

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